

STUDIES ON THE NEMATODE PARASITES OF INSECTS AND OTHER ARTHROPODS

(With 117 text-figures)

P. NARAYAN RAO, M.Sc.

Research Fellow, Department of Zoology,
University College of Science, Osmania University,
Hyderabad

SYNOPSIS

This work comprises three parts dealing with the morphology and systematics of nematodes parasitic in Arthropods found in Hyderabad, Andhra Pradesh, India. It deals with 23 species belonging to 20 genera in 4 different families of nematodes. Of the 23 species described 9 are new and for 6 of these new genera have been proposed. A new family has also been erected to include three genera parasitic in Arthropods.

Part I: This part deals with the descriptions of three new genera, *Travassosinema*, *Singhiella* and *Pteronemella*; the first one is based on the type species *T. travassosi* parasitic in the millipede *Spirostreptus* sp. and the other two on new species found in the Cricket, *Gryllotalpa africana*. A new species *Rondonema spinifera* is described from the centipede *Rhisida longipes*. Known species recorded from Hyderabad are, *Indiana gryllotalpae*, *Mirzaiella asiatica*, *Chitwoodiella ovofilamenta*, all three from the Cricket *Gryllotalpa*, and *Dudekemia subtruncatum* from the millipede *Spirostreptus* sp.

Part II: This part comprises the descriptions of one new genus *Coronostoma* based on *C. singhi* sp. nov. found in the millipede *Spirostreptus* sp. and a new species *Hammerschmidtella manohari* from

the same host. *Hammerschmidtella die-singi* and *Blattophila suppellaima* are recorded from Cockroaches in Hyderabad. *Leidynema appendiculata* is reported for the first time from India.

Part III: This part deals with the accounts of two new genera *Isobinema* and *Psilocephala* for worms *I. flagellocerca* sp. nov. and *P. psilocephala* sp. nov. both found in the Cricket, *Gryllotalpa africana*. A new species *Thelastoma indica* is described from the millipede *Spirostreptus* sp. Known species recorded from the Cricket, *Gryllotalpa* in Hyderabad are *Gryllophila skrjabini*, *Binema korsakowi*, *B. mirzaia*, *B. ornata* and *Cameronia biovata*. The species *Pseudonymus hydrophili* is reported from Vizianagram, Andhra Pradesh (India).

ACKNOWLEDGMENTS

The writer takes this opportunity of expressing his deep gratitude to Professor S.N. SINGH under whose guidance the entire work was carried out. He is thankful to Mr. MOHD. ABDUL SHUKOOR, Photo-Artist, Zoology Department, for reproducing photographs of the original drawings. Thanks are due to SHRI S. RAM RAO, for typing the work. Thanks are due to DR. P. SHEEL, Head, INSDOC., for procuring photostats

and the microfilms of rare publications. Thanks are also due to the Government of India for providing a Senior Scholarship, during the period of research.

PART I.

OXYUROIDEA

Indiana Chakravarty, 1943

Indiana gryllotalpae Chakravarty, 1943
(Figs. 1-9)

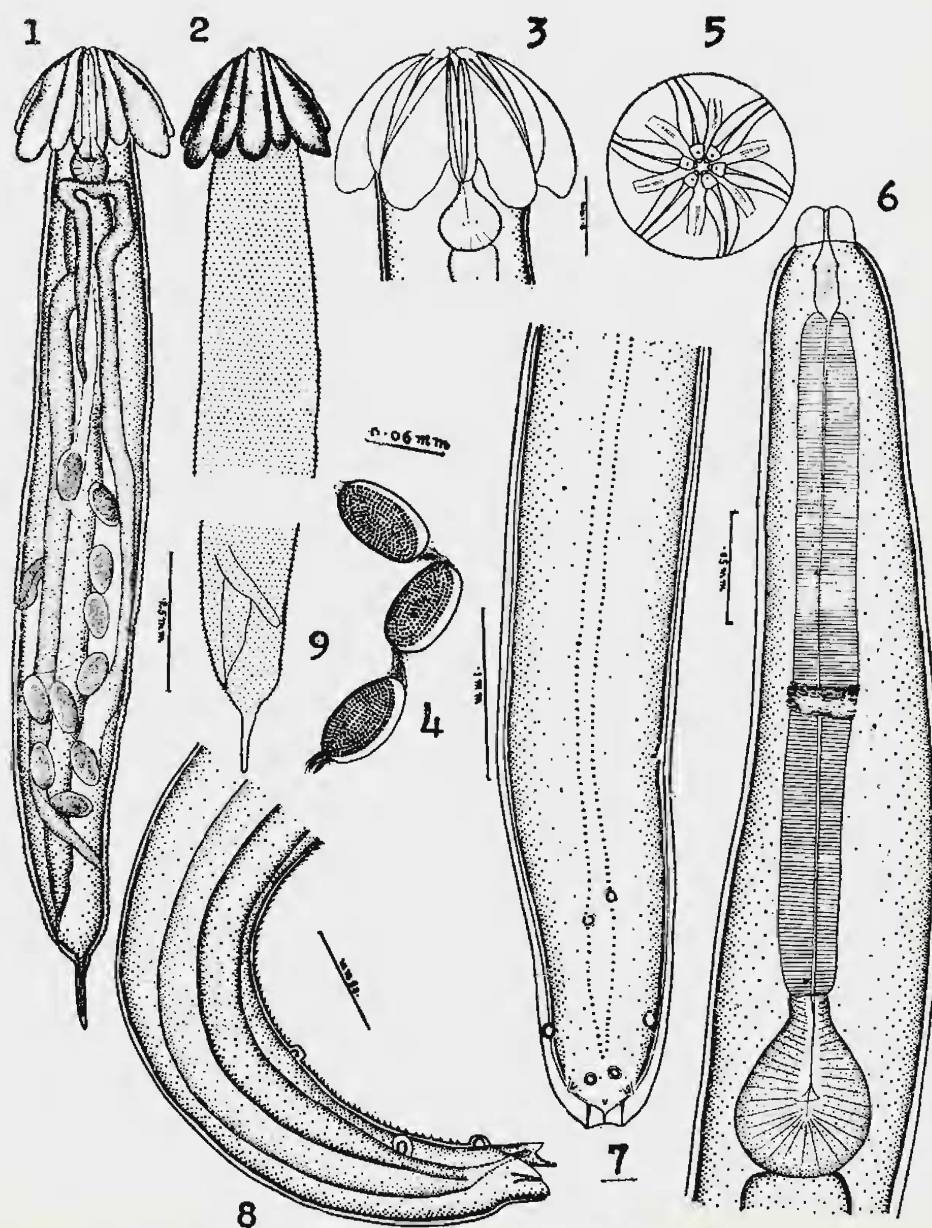
On several occasions these worms were collected by the writer from the intestine of the Cricket, *Gryllotalpa africana*, in Hyderabad. The worms occur only in small numbers since not more than 2 to 4 specimens could be obtained from a single host at any time. The males are rarely found, the writer having collected only four of these. The original description of this worm based only on females is very inadequate. The writer has therefore considered it necessary to describe the parasite in detail and to discuss its systematic position.

These are small worms with marked sexual dimorphism. The males are somewhat smaller in size than the females. The body is cylindrical in shape in both sexes; it forms anteriorly an umbellate structure in the female, whilst in the male it ends in a narrow head offset from the body. The tail of the female carries a terminal process, whilst that of the male has a truncated appearance. The cuticle is covered with transverse rows of spines in the female, but it is of a non-spinous character in the male.

Female: The females measure 1.5 — 2.3 mm. in length and 0.19 — 0.26 mm. in maximum width attained at about the middle of the body. The cuticle bears distinct transverse striations which are set at intervals of 0.005 — 0.006 mm. The

body surface, excepting the anterior end and the caudal appendage, is covered with backwardly directed spines which are arranged in transverse rows on the cuticular striae. The anterior end owes its characteristic appearance to the presence on it of a series of radiating cuticular wing-like projections. There are altogether 12 'wings', of which six are large and six are small. The large wings spring from below the lips and the small wings alternate with large ones, each lying in the angle between two adjacent large wings. The structure and arrangement of the wings is easily understood in an end on view of the head (Fig. 5). In their posterior extent the large wings reach the level of the oesophageal bulb while the small ones terminate slightly anteriorly.

The mouth is surrounded by six small lips each bearing a single papilla. Of the six papillae two appear to be amphids so that the total number of cephalic papillae found on the head is four. The mouth opens into a vestibule about 0.021 mm. long by 0.018 mm wide. The oesophagus which follows measures 0.22 mm in length and is composed of a cylindrical corpus joined by short isthmus to a spherical bulb. The corpus measures 0.14 mm. long by 0.035 mm. broad and the bulb 0.063 x x 0.067 mm. The intestine runs straight in the body towards the posterior end, the anus lying 0.16 mm. from the tip of the tail. The terminal spike-like portion of the tail is fairly prominent and forms about 2/3rd of its length. The vulva, which lacks prominent surrounding lips is situated posterior to the middle of the body, about 0.92 mm from the head end. The short and muscular vagina runs obliquely forwards from the vulva. There are two ovaries, the anterior one forms a distinct loop behind the oesophageal bulb, whilst the posterior one has its tip extending well down towards the anal region. The



Indiana gryllotalpae Chakravarty, 1943

Fig. 1. Entire female, lateral view.
 Fig. 2. Female, showing spines, lateral view.
 Fig. 3. Head end, female.
 Fig. 4. Eggs.

Fig. 5. End on view, female.
 Fig. 6. Anterior end, male, lateral view.
 Fig. 7. Posterior end, male, ventral view.
 Fig. 8. Posterior end, male, lateral view.
 Fig. 9. Posterior end, female, lateral view.

uteri contain thin-shelled eggs measuring 0.078 mm. by 0.051 mm. By means of tufts of polar filaments the eggs are connected with each other.

Males: The males measure 1.4 — 1.6 mm. in length and attain a maximum width of 0.14 — 0.15 mm. The head being devoid of cuticular wings differs markedly from that of the female; it is offset from

the body and bears three lips. The cuticle is smooth and without spines. Slightly developed lateral alae are present; these extend in front to the hind end of the oesophagus, while posteriorly they merge with the caudal alae. The mouth leads by means of a distinct vestibule into a long oesophagus composed of a cylindrical corpus, a short isthmus and a valvular

bulb. The total length of the oesophagus is 0.42 mm. and its constituent parts, corpus, isthmus and bulb, measure 0.3 by 0.037 mm., 0.03 by 0.032, and 0.09 by 0.07 mm. respectively. The male gonad consists of a single testis which extends in front to the middle of the body where it is slightly reflexed. The tail is short and truncated and bears a terminal spike. There are altogether 5 pairs of caudal papillae out of which three pairs are quite distinct and preanal, one smaller pair adanal and a slender penduculated pair post and anal in position. Of the three preanal pairs the first and the third lie closer to the median line, whilst the 2nd pair is situated near to the lateral borders of the body. On the mid ventral surface of the body are found small papillae like chitinous projections arranged in two longitudinal rows. In all there are about 85 to 90 of them in each row and they are distributed in the posterior third of the body length.

Discussion: The genus *Indiana* Chakravarty, 1943, is more closely akin to *Pulchrocephala* Travassos, 1925, than to any other nematode genus parasitic in insects. This close affinity is revealed by the presence in both of them of similar cuticular ornamentations on the female head. A close comparison of the two forms, however, would reveal the following marked differences in their structure:

- (1) *Pulchrocephala* female has 3 distinct lips as depicted by CHITWOOD (1938), whereas *Indiana* female possesses 6 minute lips.
- (2) The number and arrangement of the cuticular wings on the female head differ in the two genera.
- (3) The female body is armed with transverse rows of spines in *Indiana*, whilst it is non-spinous in *Pulchrocephala*.
- (4) The head of *Pulchrocephala* male is provided with median and lateral cephalic alae which are lacking in *Indiana*.
- (5) Chitinous papillae-like projections occur in several transverse rows on the ventral surface of the male tail in *Pulchrocephala*, whilst they form two linear series extending one third of the body length in the male of *Indiana*.

As a result of the detailed study it is proposed to give the following generic definition for *Indiana*:

Diagnosis of Indiana Chakravarty, 1943

Small worms characterised by marked sexual dimorphism. Female with 12 radiating cuticular wings on the anterior end; with transverse rows of spines on the body; tail short and provided with a distinct process; mouth surrounded by six small lips bearing 4 papillae and 2 amphids; oesophagus consisting of cylindrical corpus, isthmus and terminal spherical bulb. Vulva posterior to middle of body; vagina directed forwards; eggs with tufts of polar filaments. Male with head offset from body; cervical alae absent; oesophagus with long cylindrical corpus joined to terminal valvular bulb by short and narrow isthmus; tail short and truncated; caudal alae slightly developed, caudal papillae comprising 5 pairs; spicules absent, ventral surface of hind portion of body bearing two longitudinal rows of small chitinous projections.

Genotype: *Indiana gryllotalpae* Chakravarty, 1943.

Host: *Gryllotalpa africana*.

Habitat: Intestine.

Locality: Hyderabad, Andhra Pradesh (India).

Travassosinema travassosi gen. nov.,
 sp. nov.
 (Figs. 10-17)

The following account of the new parasite is based on material collected by the writer on several occasions during the month of September, 1955, from the intestine of the millipede *Spirostreptus* sp. The parasite occurs in fairly large numbers, 20 to 30 females in each host. The males, however, are very rare; only a single specimen having been recovered after a thorough search in a large number of millipedes.

These are small worms exhibiting marked sexual dimorphism. The females have prominent cuticular wings on the head end and possess a very long and narrow tail sharply marked off from the body. In the male the body tapers in front and behind; it forms a small rounded head without cuticular wings and a short and broadly rounded tail having a median terminal spine. The cuticle of the body excepting that of the head end is transversely striated.

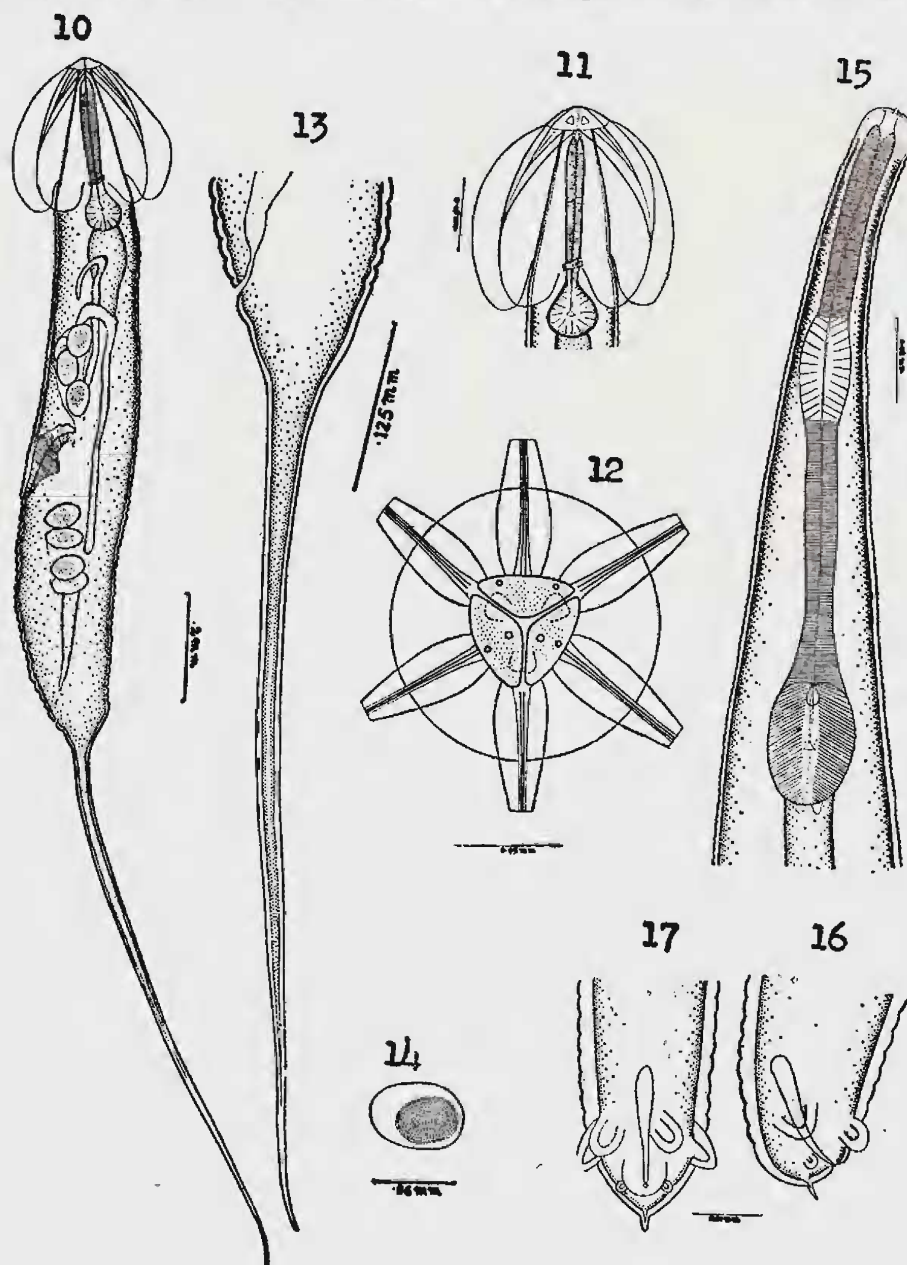
Female: The female measures 2.2 — 2.6 mm. in length and has a maximum width of 0.19 — 0.21 mm. attained at about the middle of the body. The anterior end is provided with six prominent cuticular wings arranged in a radiating manner. The wings are of the same size; they originate immediately behind the lips extending posteriorly to the mid level of the oesophageal bulb. Of the six wings three are found facing the lips and the other three have their longitudinal axes passing between the lips. Their structure and arrangement is seen to an advantage in an end on view of the head (Fig. 12). The mouth is surrounded by a dorsal and two subventral lips. There are 4 cephalic papillae, of which a pair is situated on the dorsal lip and one on each subventral lip.

The latter also have the amphids located internal to the cephalic papillae. The mouth opens into a vestibule 0.025 mm. long. This is followed by an oesophagus whose total length is 0.13 mm., of which 0.123 mm. is occupied by the corpus and 0.07 x 0.077 mm. by the bulb. The isthmus separating the corpus from the valvular bulb is not well differentiated. The nerve ring, which is 0.102 mm. from the head end, encircles the oesophageal corpus near its posterior end. The anus is 1.2 mm. from the tip of the tail. The worm under study is characterised by the presence of a very long tail composed of a short and thick portion and long filiform appendage, the two together occupying 45% of the body length. There are two ovaries; one terminates anteriorly in a reflexed tip in the region of the slightly expanded intestinal cardium, whilst the other one lies outstretched with its tip pointing towards the rectum. The two uteri open into a thick walled muscular vagina which communicates with the exterior at the vulva, situated 0.9 mm. from the head end. The position of the vulva divides the preanal portion of the body in the ratio of 2:1. The eggs contained in the uteri are thin-shelled measuring 0.07 x 0.06 mm.; they are devoid of filaments and hence do not form chains when released from the parent body.

Male: The single male available for study measured 0.95 mm. in length and 0.072 mm. in maximum transverse diameter. The cuticular striations on the body are very fine, about 0.002 mm. apart in the anterior part of the body and 0.003 mm. at about its middle. The body is provided with slightly developed lateral alae which extend in front to hind end of the oesophagus, whilst posteriorly they make an inconspicuous caudal alae. The head is knob-like with rounded sides and is devoid of cuticular striae. There are 4

cephalic papillae; amphids, however, could not be observed. The mouth opens into a cylindrical buccal cavity measuring 0.006 mm. long by 0.004 mm. wide. The oesophagus, about 0.171 mm. long, has in its course a single anterior enlargement in addition to the terminal valvular bulb, the two being separated by a long isthmus. The short and cylindrical corpus measures 0.046 mm. x 0.006 mm. and the anterior

and posterior bulbs 0.026 x 0.022 mm. and 0.029 x 0.02 mm. respectively. The isthmus is 0.07 mm. long by 0.008 mm. wide. The testis extends in front to the middle of the body where it terminates in a re-flexed tip. The tail is short and rounded measuring 0.010 mm. in length and is provided with a median terminal spine. The caudal alae, which are only feebly developed, are continuous in front with



Travassosinema travassosi gen. nov., sp. nov.

Fig. 10. Entire female, lateral view.
 Fig. 11. Head end, female, lateral view.
 Fig. 12. End on view, female.
 Fig. 13. Posterior end, female, lateral view.

Fig. 14. Egg.
 Fig. 15. Anterior end, male, lateral view.
 Fig. 16. Posterior end, male, lateral view.
 Fig. 17. Posterior end, male, ventral view.

the lateral alae. The caudal papillae comprise 2 large preanal pairs and a small adanal pair. The anterior pair of the preanal papillae are situated closer together than the 2nd pair which is distinctly lateral in position. A single spicule is present which has a rounded head and a sharply pointed tip; it measures 0.02 mm. in length.

Discussion: The new parasite exhibits well defined characters which reveal its kinship to the genera *Pulchrocephala* Travassos, 1925, and *Indiana* Chakravarty, 1943. The feature which it predominantly shares with these two genera is the presence of prominent cuticular wings on the anterior end of the female. To some extent the male of the newly found worm also agrees in general appearance with those of the two earlier genera. It, however, differs from *Indiana* in the following features:

- (1) The female of the new parasite is distinguishable from that of *Indiana* by the absence of spines on the body.
- (2) There are only 3 lips on the female head in the new genus, whereas *Indiana* female possesses as many as 6 cephalic lips.
- (3) There are 12 cuticular wings on the female head in *Indiana*, whilst that of the new parasite has only six wings.
- (4) Tufts of filaments are present on the eggs of *Indiana*. These are lacking on the eggs of the new worm.
- (5) Male tail bears two longitudinal series of small spines in *Indiana* which are lacking in the present worm.

The new genus is also distinguishable from *Pulchrocephala* by the following diagnostic features:

- (a) The tail of the female in the new genus is conspicuously long.
- (b) The male head is without alae.
- (c) The oesophagus in the male is characterised by the presence of a median bulb.
- (d) A distinct spicule is present.

As a result of these differences the writer feels justified in establishing a new genus for which the name *Travassosinema* is proposed in honour of Professor L. TRAVASSOS.

Diagnosis of Travassosinema gen. nov.

Small worms exhibiting marked sexual dimorphism. Females having head end ornamented with 6 prominent cuticular wings; tail very long; composed of a short basal portion and a very long filiform appendage; mouth surrounded by 3 lips bearing 4 papillae and a pair of amphids; oesophagus having cylindrical corpus separated from valvular bulb by ill defined isthmus. Vulva dividing preanal portion of body in ratio of 2:1; vagina strongly muscular and directed anteriorly; eggs thin-shelled and without filaments. Male with knob-like head devoid of alae; oesophagus having additional median bulb; tail short and rounded, bearing small terminal process; caudal alae poorly developed; caudal papillae comprising 3 pairs, 2 preanal and one adanal; single spicule present.

Genotype: *Travassosinema travassosi* named after Professor TRAVASSOS.

Host: *Spirostreptus* sp.

Habitat: Intestine.

Locality: Hyderabad, Andhra Pradesh (India).

Type specimens will be deposited in the museum of the Zoology Department, College of Science, Osmania University.

Systematics: TRAVASSOS (1929) established the family *Lepidonemidae* under which he included *Pulchrocephala* along with two other genera *Lepidonema* and *Hystriognathus*. Subsequently CHITWOOD (1932) merged *Lepidonemidae* with *Thelastomatidae* TRAVASSOS, 1929. Again in 1934 FILIPJEV revived *Lepidoneminae* which, however, he referred to the family *Kathlaniidae*. CHITWOOD (1938) transferred *Pulchrocephala* to *Atractidae* but later (1951) Skrjabin assigned it back to *Thelastomatidae* under its type subfamily *Thelastomatinae*. It is noteworthy, however, that BASIR (1956) in his monographic study of Oxyuroid parasites of Arthropods does not include *Pulchrocephala* either under *Thelastomatidae* or *Oxyuridae*. From the above account it is evident that the systematic position of the genus has so far remained uncertain.

As a result of the detailed study of two allied genera, *Indiana* CHAKRAVARTY, 1943 and the new genus *Travassosinema* the writer has come to the conclusion that these genera constitute an isolated group of nematodes which justify their inclusion in a new subfamily under a new family. For these the names *Travassosinematinae* and *Travassosinematidae* are proposed in honour of Professor L. TRAVASSOS.

Key to Oxyuroidea parasitic in Arthropods

Female head with distinct wing like cuticular ornamentations
..... *Travassosinematidae* fam. nov.

Female head simple, without wing like ornamentation *Oxyuridae*

Diagnosis of Travassosinematidae fam. nov.

Oxyuroidea with cuticle striated. Sexual dimorphism distinctly marked. Female head provided with distinct wing like cuticular ornamentations. Cuticle with or without spines. Mouth surrounded by three or six lips bearing six labial papillae. Amphids present. Oesophagus consisting of a corpus, a narrow isthmus and a terminal valvular bulb. Female: Vulva at middle of the body; gonad double; eggs either connected with each other by threads and released in a chain, or simple and released singly. Male: with or without a spicule. Parasites of Myriapods and Insects.

Travassosinematinae subfam. nov.

With characters of the family as defined above.

Key to Genera

1. Female head with 6 small lips; body covered with transverse rows of spines *Indiana*.
Female head with 3 distinct lips, body not covered with spines 2.
2. Tail of female with a short terminal process *Pulchrocephala*.
Tail of female with a very long fili-form appendage *Travassosinema*.

Rhigonematidae Artigas, 1930

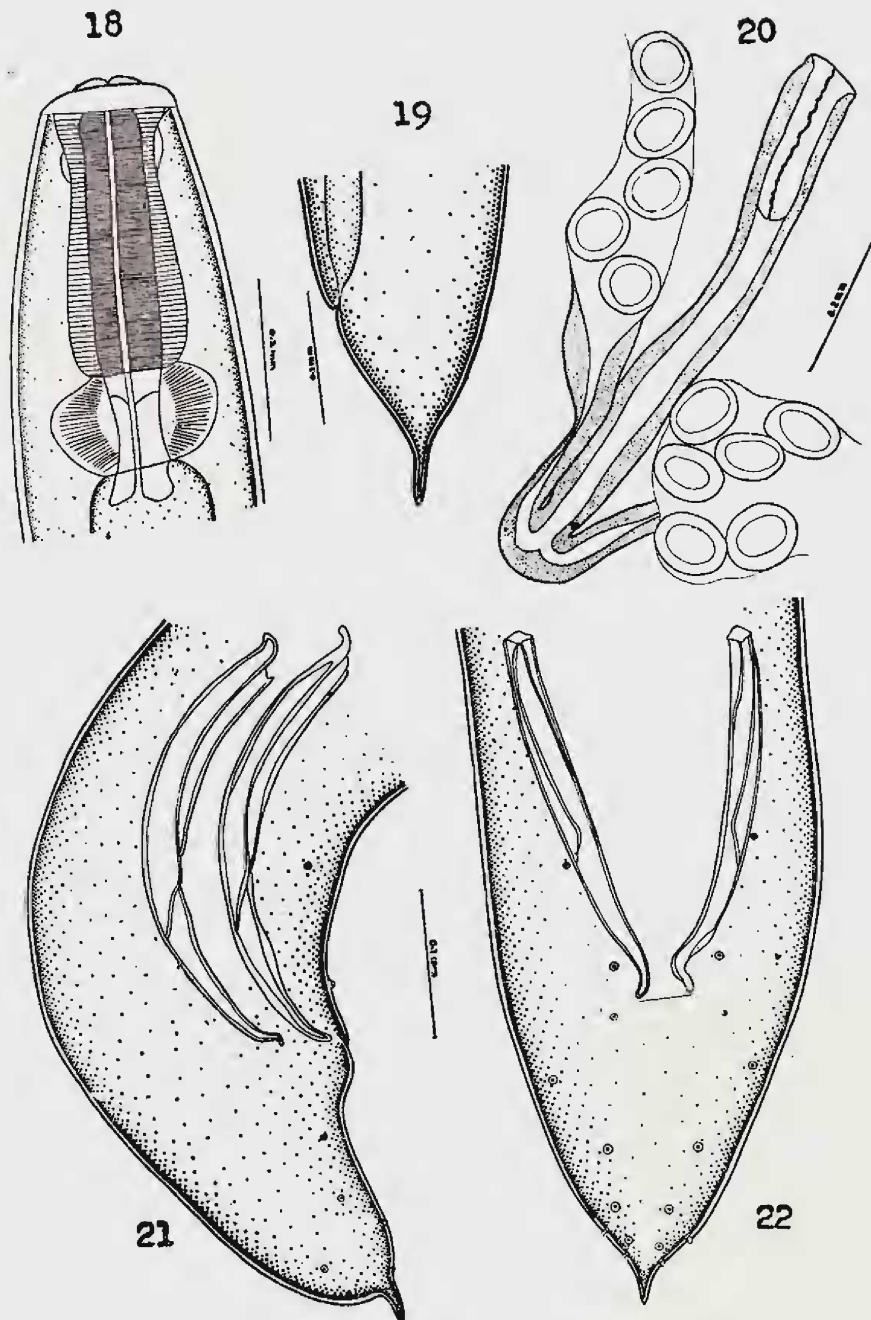
Rhigonematinae Artigas, 1930

Dudekemia Artigas, 1930

(Syn: *Isakis* Lespes, 1856)

Dudekemia subtruncatum (Dollfus, 1952)
(Figs. 18-22)

This species was described in 1952 under the name *Rhigonema subtruncatum* by DOLLFUS who assigned all the species of *Dudekemia* to the genus *Rhigonema*



Dudekemia subtruncatum (Dollfus, 1952)

Fig. 18. Anterior end, female, lateral view.
Fig. 19. Posterior end, female, lateral view.

Fig. 20. Vulvar region.
Fig. 21. Posterior end, male, lateral view.
Fig. 22. Posterior end, male, ventral view.

Cobb, 1898 because he did not recognise the presence of the massive sac connected with the vagina vera in *Rhigonema* to be of diagnostic importance. The writer is not in agreement with this view and is of the opinion that in view of the absence of the sac in *Dudekemia* this genus should be retained and not merged with *Rhigo-*

nema. It is, therefore, proposed to assign *Rhigonema subtruncatum* of DOLLFUS to the genus *Dudekemia*. Since the account of this worm as given by DOLLFUS is meagre, the writer has considered it advisable to give a fuller description of the parasite which was collected once from the intestine of *Spirostreptus* sp. in Hyderabad.

The cylindrical body in both the sexes forms a broad truncated head end whilst posteriorly it forms a short and conical tail. The cuticle carries fine transverse striations which could be observed only under high magnification. The mouth is surrounded by 3 lips of which one is dorsal and two subventral in position. Situated at the base of the lips there are 4 submedian papillae and a pair of laterally situated amphids; two papillae are placed on the dorsal lip and one papillae and an amphid on each of the subventral lips. Just internal to the mouth the cuticular lining is raised into 3 denticulated ridges corresponding to the lips. The oesophagus consists of a broad cylindrical corpus communicating directly with the valvular bulb, a feature common to the species of *Dudekemia* and *Rhigonema*. In the worm under study the length of the corpus is roughly two and a half times, that of the bulb. The portions of the oesophagus measure 0.31 — 0.35 by 0.1 — 0.12 mm. and 0.12 — 0.14 by 0.135 — 0.16 mm. in the female, and 0.24 — 0.3 by 0.09 — 0.1 mm. and 0.11 — 0.12 by 0.13 — 0.15 mm. in male respectively.

Female: The females vary in length from 5.7 to 6.3 mm. and in maximum width from 0.31 to 0.5 mm. The nerve ring crosses the oesophagus at 0.2 — 0.25 mm. from the head end. The tail is short and bears a terminal spine. It is 0.16 — 0.17 mm. long and forms about 1/25th of the body length. The vulva which is flush with the body surface, is situated postequatorially at 3.35 mm. from the anterior end. The vagina runs posteriorly from the vulva and is connected with the two uteri which are directed forward at the junction. The massive sac between the vagina and uteri present in *Rhigonema* species, is characteristically absent as in other species of *Dudekemia*. In the specimens under study the uteri were fully

packed with eggs measuring 0.084 — 0.09 by 0.065 — 0.07 mm.

Male: The males measure 3.8 — 4.67 mm. in length and 0.27 — 0.29 mm. in greatest width. The lips and the papillae have the same arrangement as found in the females. The tail measuring 0.18 — 0.22 mm. in length is conical and bears a short terminal spine. Caudal alae are lacking as in other species of the genus and there are two well developed arcuate spicules measuring 2.9 — 3.0 mm. in length. The sessile caudal papillae present on the tail comprise 9 pairs of which 2 are preanal and the remaining 7 pairs postanal in position. The second pair of preanal papillae is located close to the anus, whilst the 1st pair lies at some distance in front and slightly external in position to the 2nd pair. Of the postanal papillae 1st, 3rd, 4th and 6th are ventral in position, the 2nd pair is approximated towards the lateral border, whilst the 5th and 7th pairs actually project laterally from the tail. In the male tail figured by DOLLFUS the spicules seem to occupy a somewhat posterior position and only 3 pairs of postanal papillae are shown. The tail appears to be distorted due to pressure.

The species is recorded here for the first time from India.

Host: *Spirostreptus* sp.

Habitat: Intestine.

Locality: Hyderabad, Andhra Pradesh (India).

Carnoyinae Filipjev, 1934

Rondonema Artigas, 1926

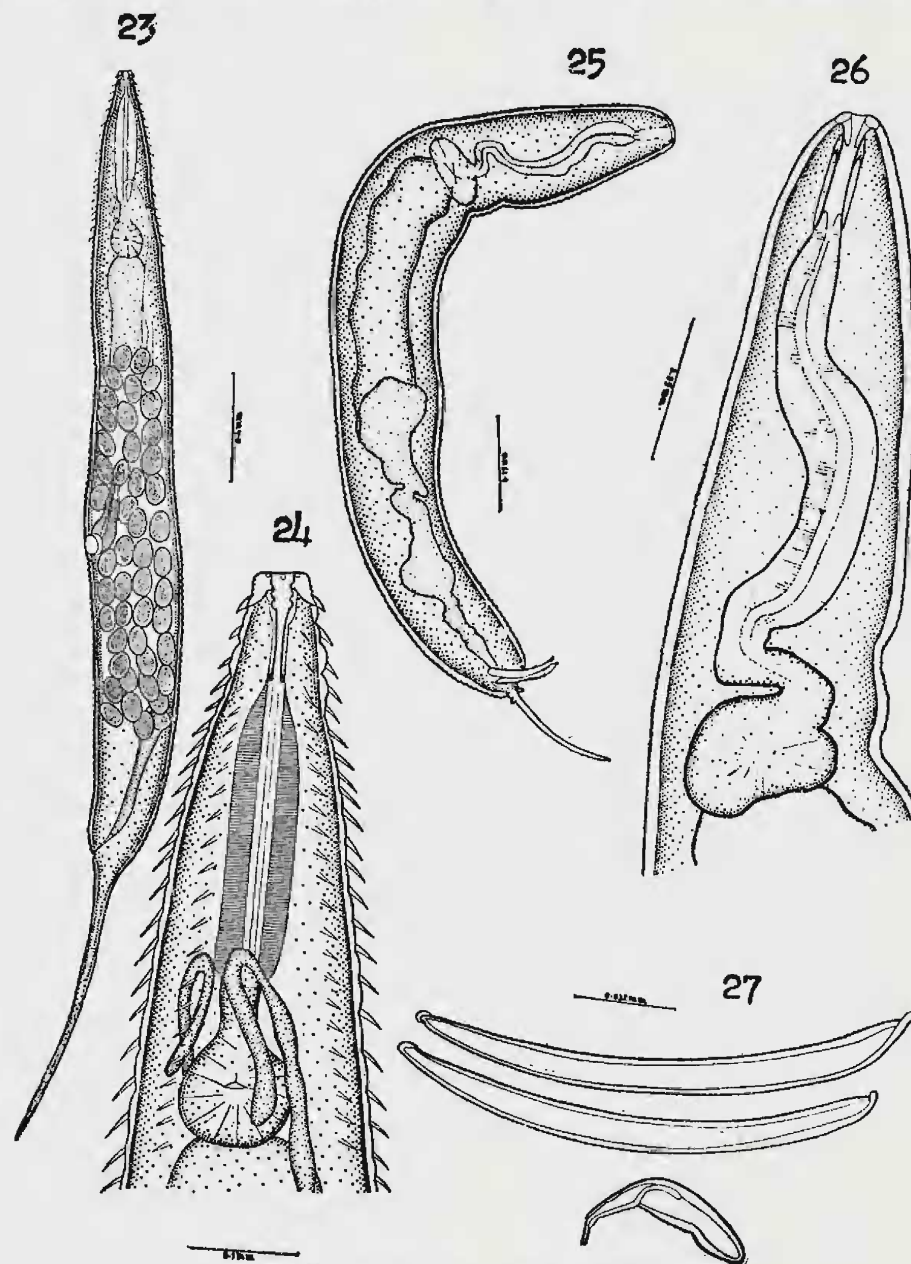
Rondonema spinifera sp. nov.
(Figs. 23-27)

The following account of a new species of *Rondonema* is based on material collected once, from the intestine of a Centipede *Rhisida longipes*. The material studied consists of 2 females and 3 males.

In both sexes the cylindrical body tapers in the oesophageal region to form a somewhat truncated head end. The tail in either sex bears a filiform caudal appendage which is comparatively longer in the female. The cuticle carries transverse striae which are rather coarse in the oesophageal region in the female.

Female: The females measure 3.4 — 4.16 mm. in length and 0.33 — 0.45 mm. in greatest width. The first 4 cuticular

striae found in the head are 0.002 mm. apart, next 5 striae being set at intervals of 0.006 — 0.010 mm. and the subsequent one at 0.018 mm. from the head end to the level of the intestinal cardium. The body is armed with spines arranged in 6 longitudinal rows each having 22 posteriorly directed spines. Distinct lips are lacking on the head but surrounding the mouth there are 2 pairs of submedian papillae and a pair of laterally situated am-



Rondonema spinifera sp. nov.

Fig. 23. Entire female, lateral view.
Fig. 24. Anterior end, female, lateral view.

Fig. 25. Entire male, lateral view.
Fig. 26. Anterior end, male, lateral view.
Fig. 27. Spicules.

phids. The buccal cavity is funnel-like in shape measuring 0.046 — 0.051 mm. in length. It is followed by the oesophagus which is composed of a long cylindrical corpus, a short isthmus and a terminal valvular bulb; the three portions measuring 0.25 — 0.27 x 0.056 mm.; 0.047 — 0.051 x 0.029 — 0.039 mm. and 0.106 mm. diameter respectively. The front end of the intestine is dilated to form a caecum which is distinctly wider than the oesophageal bulb. The anus is 1.05 mm. from the tip of the filiform caudal appendage and is separated from the vulva by an equal distance in front of it. The vulva is 2.1 mm. from the head end and is separated from the anus by a distance of 1.02 mm.; it is surrounded by a strongly cuticularised rim and leads into a muscular vagina directed forwards. The latter is connected to a well differentiated ojector which in turn is joined to the common trunk of the uterus. The two uteri branching out from the common trunk coil back and forth in the body and are ultimately connected with the ovaries by means of short and narrow oviducts. The tip of the ovaries are reflexed and the short loops thus formed lie symmetrically along side the oesophageal bulb projecting slightly beyond the hind end of the corpus. The eggs contained in the uteri are fairly large measuring 0.110 — 0.129 by 0.073 — 0.085 mm.

Male: The males which are slightly less than half the size of the females, measure 1.29 — 1.47 mm. in length and 0.17 — 0.19 mm. in greatest width. Fine cuticular striae are present throughout the length of the body. The caudal appendage is sharply marked off and the spines present on the anterior part of the body in the female are completely lacking. The cephalic papillae have the same number arrangement as found in the female. The

vestibule is cylindrical in shape and its wall is composed of 3 segments; it is 0.036 mm. long by 0.021 mm. wide. The corpus has a length of 0.232 mm. with a maximum width of 0.035 mm. at its middle. A short isthmus, about 0.057 mm. by 0.022 mm., connects the corpus with the terminal valvular bulb measuring 0.086 mm. by 0.049 mm. The single testis extends roughly to the middle of the body. A pair of well developed spicules are present which have broad anterior and narrow posterior portions terminating in bluntly pointed tips. They are slightly curved and measure 0.147 — 0.16 mm. in length. A prominent keel-shaped gubernaculum is present measuring 0.078 — 0.08 mm. in length. The tail is devoid of alae but caudal papillae are present comprising two preanal and two postanal pairs. The preanal pairs are equally spaced and situated towards the lateral borders of the body, whilst postanal pairs lie close together at the base of the filiform caudal appendage.

Discussion: ARTIGAS (1930) established the genus *Rondonema* with *Rondonema rondoni* as type. Subsequently DOLLFUS (1952) added the species *R. pseudonanolenu* which he refers doubtfully to this genus. This worm though it agrees closely with the type species in the internal anatomy, differs from it in the complete absence of spines on the female body. In this respect the new parasite also differs from the worm described by DOLLFUS. The account of the female of *R. rondoni* as given by ARTIGAS is based on immature females and as such it is not possible to compare it in detail with the parasites described herein. The latter can, however, be excluded from *R. rondoni* on the following grounds:

- (1) The spines on the body are arranged in 6 rows in the new form,

whereas there are only two rows of spines present in *R. rondoni*.

- (2) The oesophagus in *R. spinifera* has a long corpus and a short isthmus. On the other hand it has a short corpus and a long and narrow isthmus in *R. rondoni*.
- (3) The filiform tail appendage of the new parasite is unlike that of *R. rondoni* in being sharply marked off from the body.
- (4) The postanal caudal papillae are close together in the worm under discussion, whilst they are considerably apart in *R. rondoni*.

In view of its distinguishing anatomical features the worm described above is considered to be new to science. It is proposed to name it *Rondonema spinifera* sp. nov.

Host: *Rhisida longipes* (New Port).

Habitat: Intestine.

Locality: Hyderabad, Andhra Pradesh (India).

Type specimens will be deposited in the museum of the Zoology Department, College of Science, Osmania University.

Oxyuridae Cobbold, 1864

Singhiella singhi gen. nov., sp. nov.

(Figs. 28-31)

During the month of July, 1955 the writer collected six female specimens of this new parasite from the intestine of the field cricket, *Gryllotalpa africana*. They resembled *Chitwoodiella* Basir, 1948 in the manner of laying eggs in a chain, whilst their buccal capsule showed resemblance to that of *Mirzaiella* Basir, 1942. Since the worm could not be identified with either of them or any other nematode genus parasitic in Arthropods, it was concluded

that the worm constituted a new genus. The males appear to be very rare, since the writer could not recover even a single specimen of other sex even after prolonged search.

The females measure 1.95 — 2.22 mm. in length and 0.16 — 0.27 mm. in greatest width. The body of the worm narrows both in front and behind; at the anterior end it narrows a little and then broadens to form a slightly expanded head, whilst posteriorly it ends in a short tail bearing a sharply pointed appendage. The cuticle of the anterior portion of the body bears distinct striae set at intervals of 0.004 mm. The mouth is surrounded by six elevated lips, four being submedian and two lateral in position. The latter are simple, whilst the former have lateral wing-like projections or lobes directed obliquely backwards. The lateral lobes of consecutive lips overlap each other as illustrated in figure 31. There are 4 papillae, each submedian lip carrying one. The laterally situated lips are without papillae; they probably bear the amphids which are difficult to observe. The mouth leads into a well defined buccal cavity divided into an anterior and a posterior chamber. The latter is occupied by leaf-like cuticular plates. The lining of the anterior chamber also is thrown into longitudinal ridges. The oesophagus is very long occupying more than one third of the body length. It consists of a long cylindrical corpus joined by a short isthmus to a spherical valvular bulb. The total length of the oesophagus is 0.66 — 0.71 mm., corpus occupying 0.54 — 0.68 mm., isthmus 0.08 — 0.1 mm. and valvular bulb 0.08 — 0.1 mm. The intestine is slightly wider than the oesophageal bulb in its anterior extent, whilst posteriorly it narrows evenly towards the rectum. The anus is 0.2 — 0.25 mm. from the tip of the caudal appendage. The vulva is rendered

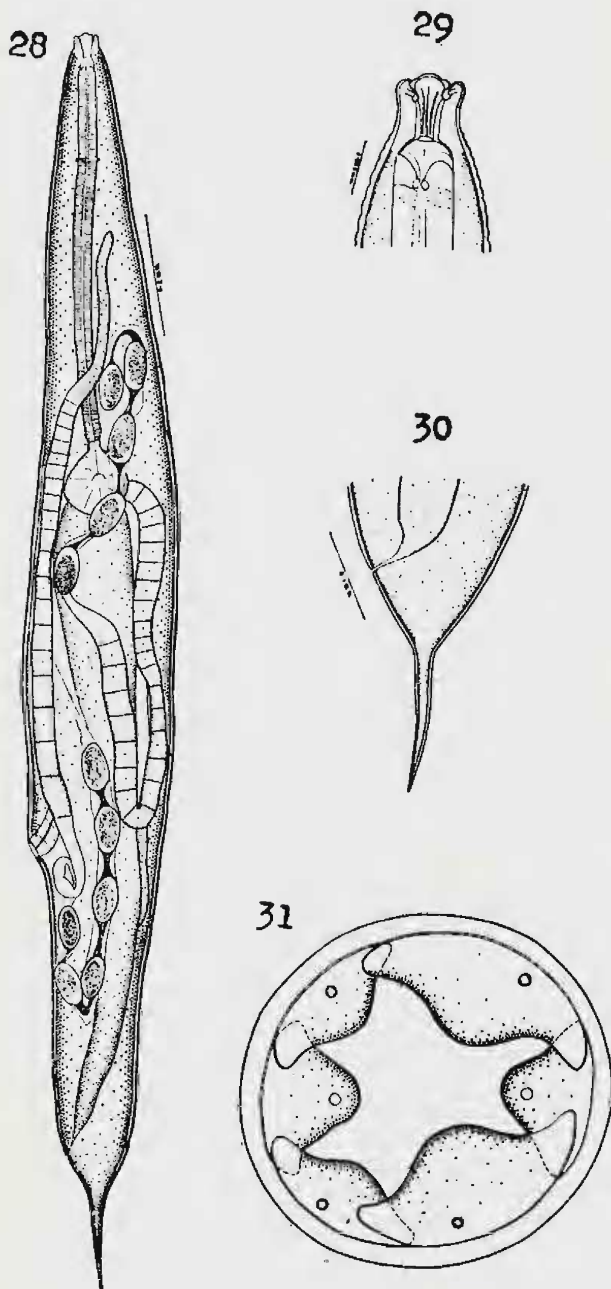
conspicuous by the sudden narrowing of the body immediately posterior to it. It is situated anterior to the junction of the posterior and middle thirds of the body; it is 1.2 — 1.5 mm. from the head end. The vagina runs anteriorly from the vulva and the divergent uteri open into it by means of a short common trunk. Each

uterus forms a loop; the anterior one reaches into the region of the oesophageal corpus, whilst the posterior one extends half way down between the vulva and the anus. The latter at its junction with the oviduct forms a sac-like receptaculum seminis. There are two filamentous ovaries, the anteriorly directed one, which is connected to the posterior uterus runs almost in a straight course with its tip reaching the mid level of the oesophageal corpus. The other ovary which runs in continuation with the anterior uterus is reflexed first at the vulval region and again at the level of the oesophageal bulb from where it runs posteriorly with its tip projecting towards the rectum. The eggs are joined in a chain-like manner by means of polar filaments, a feature in which they resemble the eggs of *Chitwoodiella*. They measure 0.069 — 0.08 mm. by 0.04 — 0.05 mm.

Male: Unknown.

Systematics: The presence of 6 distinct lips would distinguish the newly formed worm from all the known genera included under *Oxyuridae* by BASIR, 1956. As regards its kinship to the known forms it is clear that while it agrees with the genus *Chitwoodiella* in the character of the eggs, it is more closely related to *Mirzaiella* as is indicated by the structure of the vestibule, and by the disposition of the gonads and shape of the tail in the female. The new genus besides differing in the number and structure of lips from *Mirzaiella* can be further differentiated in the following features:

- (1) In *Singhiella* the posterior chamber of the vestibule is much wider than the anterior one and is occupied by the leaf-like cuticular plates. On the other hand in *Mirzaiella* the two chambers are equal in size, whilst cuticular pla-



Singhiella singhi gen. nov., sp. nov.

- Fig. 28. Entire female, lateral view.
 Fig. 29. Head end, female.
 Fig. 30. Posterior end, female, lateral view.
 Fig. 31. End on view, female.

tes have not been observed in the posterior chamber.

- (2) Oesophagus occupies more than 1/3rd of body length in the new worm, whereas it is about 1/4th the body length in *Mirzaiella*.
- (3) Eggs of *Singhiella* are released in the form of a chain, whilst those of *Mirzaiella* are laid in mucous capsules.

In view of the presence of 6 distinct lips and other characters discussed above, the writer considers it necessary to establish a new genus and species for the reception of the worm described above. It is proposed to name it *Singhiella singhi* gen. nov. et. sp. nov. after Professor S.N. SINGH.

Diagnosis of *Singhiella* gen. nov.

Female: With 6 distinct lips; 4 papillae present on submedian lips; cuticle striated; vestibule divided into a narrow anterior chamber and a broad posterior chamber, the latter occupied by leaf-like plates; oesophagus over 1/3rd the body length, composed of a long cylindrical corpus, a short isthmus and a spherical valvular bulb. Tail short and provided with a spike-like caudal appendage. Vulva about the junction of middle and posterior thirds of the body; vagina directed anteriorly, uteri and ovaries opposed, eggs with polar filaments and layed in the form of a chain.

Genotype — *Singhiella singhi* parasitic in the intestine of the field cricket, *Gryllotalpa africana*.

Locality: Hyderabad, Andhra Pradesh (India).

Type specimens will be deposited in the museum of the Zoology Department, College of Science, Osmania University.

Mirzaiella Basir, 1942

Mirzaiella asiatica Basir, 1942

(Figs. 32-34)

BASIR (1942) described this parasite as type of his genus *Mirzaiella* basing his description on the female only. In the same paper, however, he described earlier another nematode worm from the same host under the name *Gryllocola gryllocola* gen. et. sp. nov. Subsequently (1956) as a result of his detailed study of the structure of these forms he considers his *Gryllocola* female as synonym of *Binema* and *Gryllocola* male, as belonging to his species *Mirzaiella asiatica*. He also corrects (1956) his description of the enface view of *Mirzaiella* head pointing out that the head bears 4 papillae instead of 8 as described by him earlier. As a result of this he transferred *Mirzaiella* from *Thelastomatidae* to *Oxyuridae* which are characterised by the presence of 4 papillae.

The writer collected both male and female specimens of this species from the same host in Hyderabad and after a detailed study of its structure is able to confirm the findings of BASIR (1956). With this view a short account of the parasite is given below.

Female: The female varies in length from 2.3 — 2.98 mm. and in maximum thickness from 0.25 — 0.29 mm. Cuticle is striated, the striations being distinctly marked in the anterior region of the body; they are set at intervals of 0.01 — 0.015 mm. in front and at 0.018 mm. in their posterior extent. The mouth is surrounded by 3 well developed lips which bear 4 papillae as figured by BASIR (1956). Buccal cavity measures 0.062 by 0.028 mm. and is composed of two equal chambers. Indications of internal cuticular projections in the posterior chamber corresponding to those described for *Singhiella singhi* were observed by the writer. The

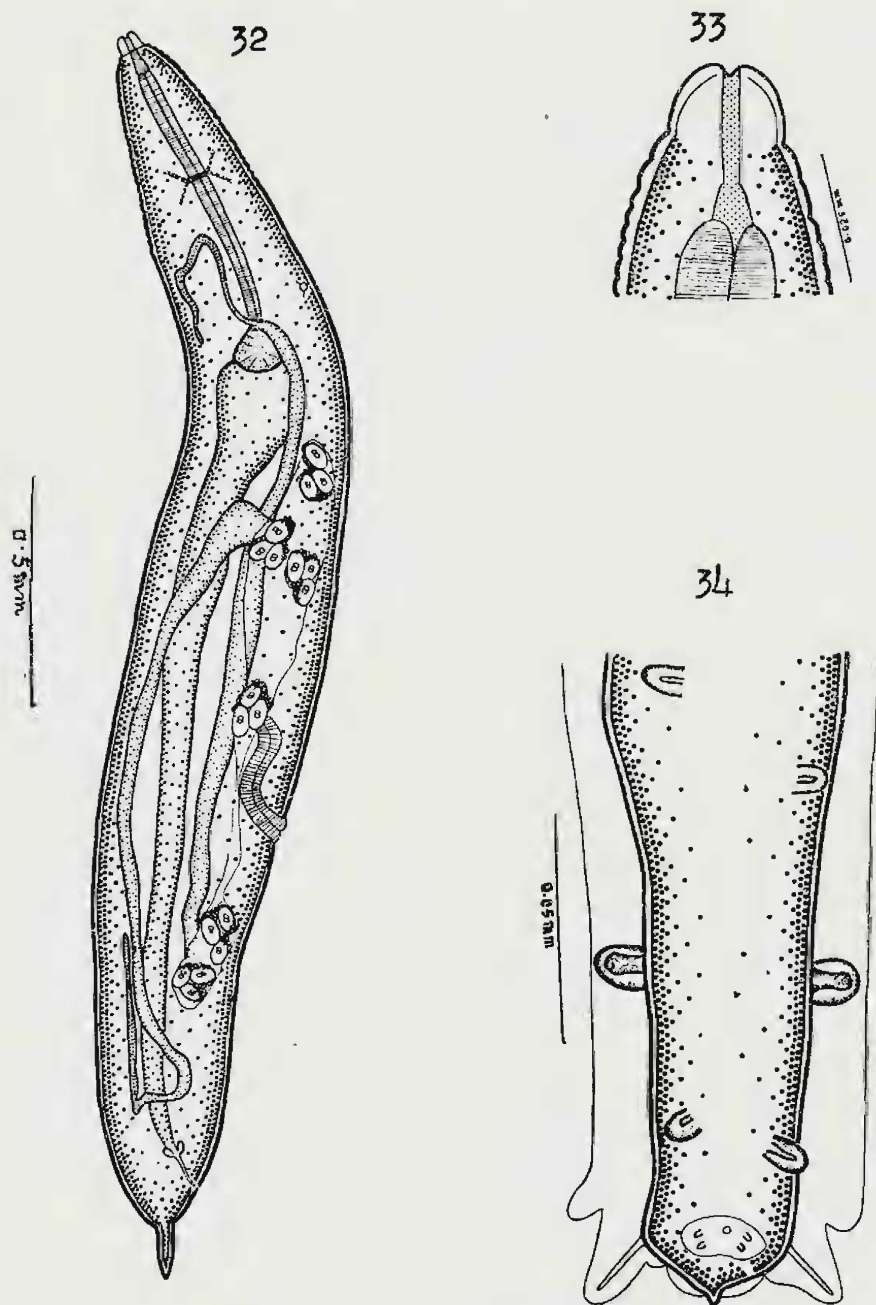
*Mirzaiella asiatica* Basir, 1942

Fig. 32. Entire female, lateral view.

Fig. 33. Head end, male, lateral view.

Fig. 34. Posterior end, male, ventral view.

oesophagus is 0.66 — 0.85 mm. long occupying roughly 25-30% of the body length. The corpus measures 0.55 — 0.65 mm. by 0.05 — 0.062 mm. and the isthmus 0.015 — 0.022 mm. by 0.03 — 0.036 mm. The nerve ring is 0.3 mm. from the head end. The vulva is located at a distance of 1.53 — 1.82 mm. from the head end, its position dividing the body in the ratio of 2:1. The muscular vagina runs ante-

riorly from the vulva and the uteri and ovaries are divergent; the anterior ovary terminates in a loop in the region of the oesophageal corpus whilst the posterior one forms a semi but slightly bigger loop in the hind quarter of the body. Eggs contained in the uteri measured 0.065 — 0.07 mm. by 0.04 — 0.045 mm. and were provided with polar tufts. They are de-

posited in mucous capsules containing 2 — 3 eggs.

Male: The male measures 0.08 — 1.1 mm. in length and 0.13 mm. in thickness. The cuticular striations are set at intervals of 0.008 — 0.01 mm. Mouth is surrounded by 3 lips which as in the female carry 4 papillae. Buccal vestibule is 0.022 mm. long by 0.004 mm. wide. The oesophagus measures 0.355 mm. in length and its component parts corpus, isthmus and bulb measure 0.25 by 0.04 mm., 0.16 by 0.023 mm. and 0.1 by 0.092 mm. respectively. The tail is truncated, about 0.045 mm. long, and is provided with a minute caudal spike. Distinct alae are present and there are three pairs of asymmetrically disposed papillae and a long and slender postanal pair. In addition to these as figured by BASIR (1956) there is pair of double papillae adanal in position. 'A median ventral rod-like projection in place of the spicules', is present as observed by BASIR (1956).

Host: *Gryllotalpa africana*.

Habitat: Intestine.

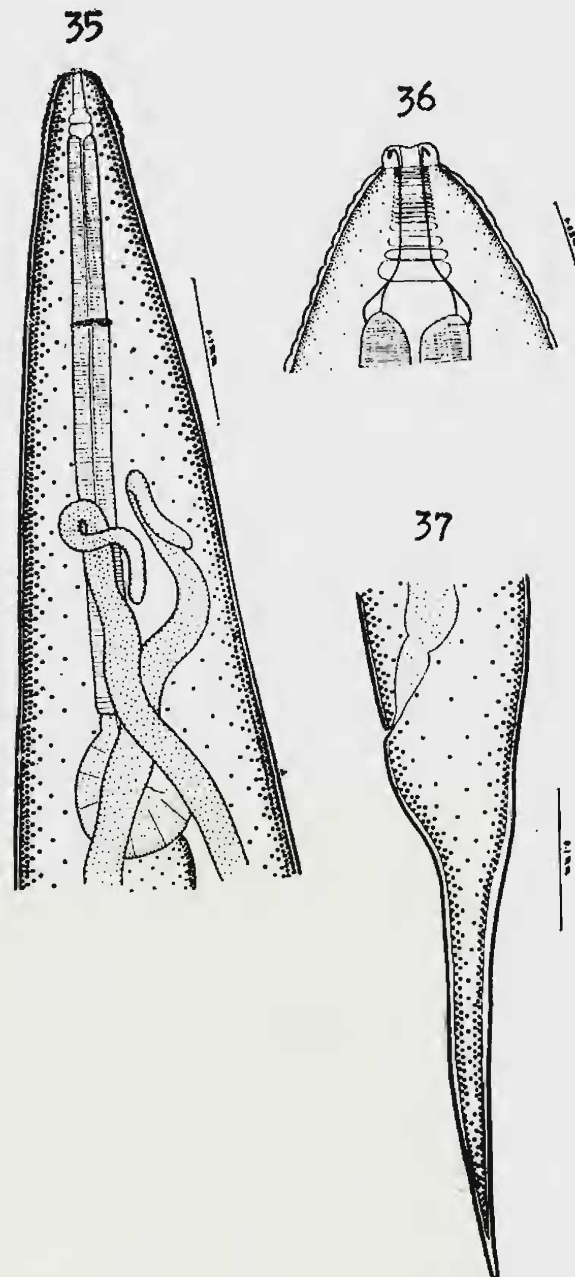
Locality: Hyderabad, Andhra Pradesh (India).

Chitwoodiella Basir, 1948

Chitwoodiella ovofilamenta Basir, 1948
(Figs. 35-37)

BASIR (1948) founded the genus *Chitwoodiella* and designated as its type *Chitwoodiella ovofilamenta* which he described from the intestine of the field cricket, *Gryllotalpa africana* in Aligarh (North India). A second species *Chitwoodiella thapari* was added by Travassos in 1953. BASIR's original description of the type species was based on females only. He included the genus under the family *Thelastomatidae* because he had observed 8 papillae on the head. In the subsequent year (1949) he described the males of this

species from material obtained from British West Indies. While examining the male head he could definitely locate only four papillae instead of eight as previous-



Chitwoodiella ovofilamenta Basir, 1948

Fig. 35. Anterior end, female, lateral view.
Fig. 36. Head end, female, lateral view.
Fig. 37. Posterior end, female, lateral view.

ly observed by him in the female. Re-examining the females he found only four papillae on the head in these also. As a result of his detailed study he expressed

the view that *Chitwoodiella* probably belong to the family *Oxyuridae*. This view was later confirmed by him in 1956 when he included his genera *Mirzaiella*, *Chitwoodiella* along with *Fontonema* Chitwood, 1930, and a new genus of his *Desmicola* in the family *Oxyuridae*.

The writer's collection of nematodes from the intestine of field crickets in Hyderabad (South India) includes both males and females of the type species *C. ovofilmenta*. Examination of the male and female head under high magnification showed that there were only 4 cephalic papillae on the head as ascertained by BASIR in 1949. The measurements of the material studied are recorded below:

Female: Length, 2.0 — 2.95 mm.; maximum width 0.2 — 0.26 mm.; cuticular striae, 0.005 — 0.008 mm. apart; buccal vestibule, 0.057 — 0.06 mm. by 0.012 — 0.02 mm.; oesophagus, 0.517 mm. long occupying 1/4th of the body length; tail 0.35 mm.; vulva, 1.7 mm. from head end, dividing body in the ratio of 3:2; eggs with polar filaments, 0.07 — 0.08 mm. by 0.04 — 0.05 mm.

Male: Length, 1.35 — 1.45 mm.; maximum width 0.08 — 0.1 mm.; buccal vestibule, 0.03 — 0.034 mm. long by 0.01 mm. wide; oesophagus, 0.38 mm. long; tail, 0.026 mm. long. Caudal papillae comprising 5 pairs, 3 preanal and two postanal in position.

Host: *Gryllotalpa africana*.

Habitat: Intestine.

Locality: Hyderabad, Andhra Pradesh (India).

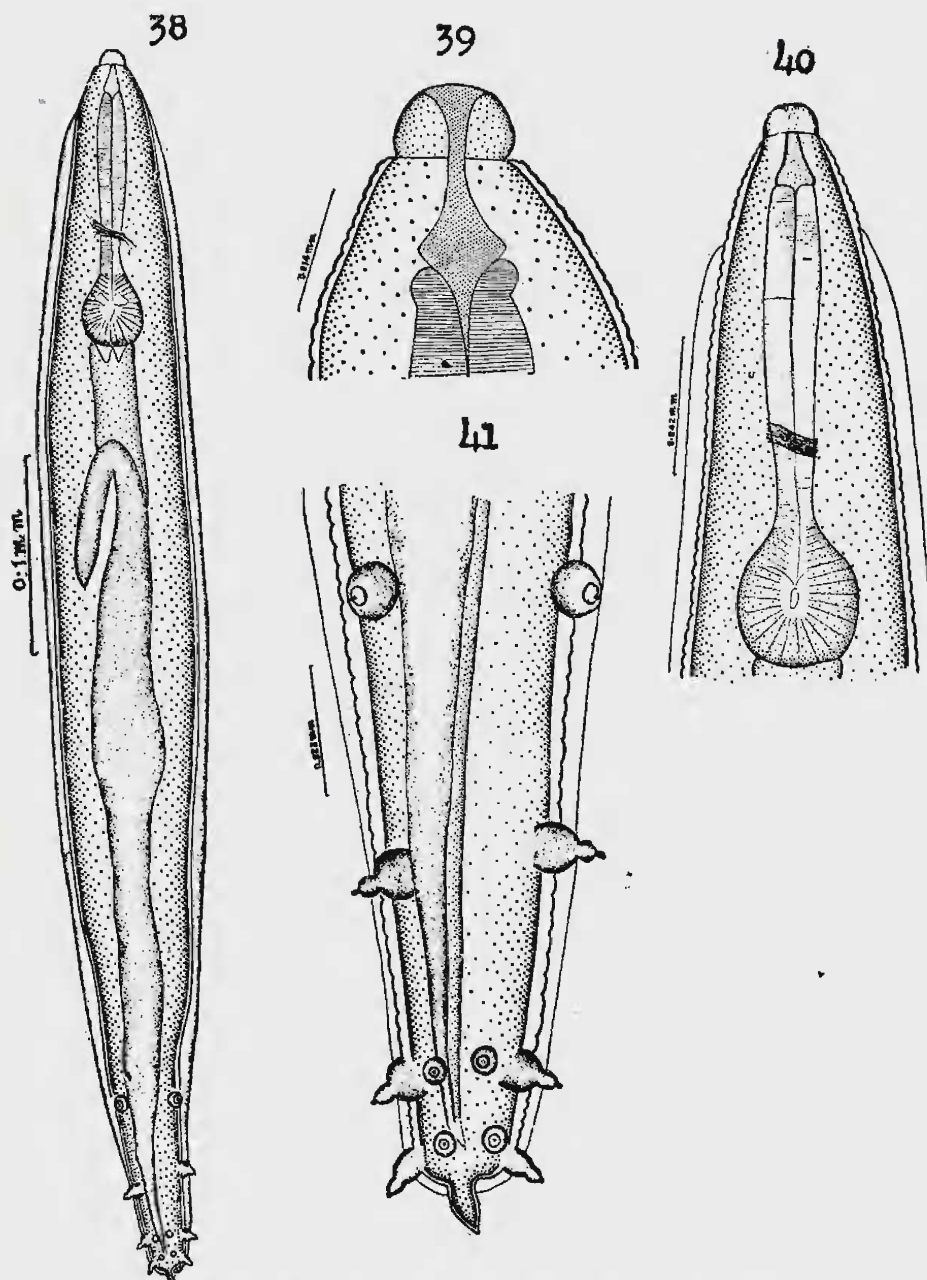
Pteronemella macropapillata gen. nov.,
sp. nov.

(Figs. 38-41)

The material available for study consists of an isolated male specimen which was collected by the writer from the in-

testine of the field cricket, *Gryllotalpa africana*.

The specimen under study has a straightened spindle shaped body a slightly rounded head end and a truncated tail bearing a median terminal process. It measures 0.63 mm. in length and maintains a maximum thickness of 0.068 mm. in the middle third of the body. The cuticle is spread out into lateral wing-like expansions or alae which extend along the entire length of the body from the tail to the level of the anterior end of the oesophagus. Transverse striae on the cuticle are found throughout the body and are set at intervals of 0.003 mm. The mouth is surrounded by three prominent lips and opens into a vestibule which can be differentiated into an anterior cylindrical and a short and wide posterior region. The oesophagus is made up of a cylindrical corpus and a valvular bulb, the two joined together by a rather ill defined isthmus. The corpus is 0.1 mm. long by 0.016 mm. wide and the bulb has a diameter of 0.036 — 0.042 mm. The nerve ring, which encircles the corpus towards its posterior half, is 0.101 mm. from the head end. The body abruptly narrows behind the anus to form a median and terminal process. The testis extends considerably beyond the middle of the body terminating in a reflexed tip. Spicules are lacking but caudal papillae are present which are voluminous and have a characteristic shape. Each papilla has an expanded basal portion surmounted by a teat like process which bears a tuft of very fine bristles. The papillae comprise four pairs of laterals and two pairs of medians. The latter lie in the same level with the corresponding two posterior pairs of lateral papillae. Though arranged symmetrically the lateral papillae are not equally spaced. The last two, that is, the 3rd and 4th pairs are closer together, whilst the 2nd pair



Pieronemella macropapillata gen. nov., sp. nov.

Fig. 38. Entire male, ventral view.
Fig. 39. Head end, male, lateral view.

Fig. 40. Anterior end, male, ventral view.
Fig. 41. Posterior end, male, ventral view.

lies in front of the 3rd pair at about 3 times the distance separating the latter from the 4th pair. The 1st and 2nd pairs are separated by a slightly wider interval than that separating the 2nd from the 3rd.

Discussion: In general appearance and the structure of the head the male described above resembles the males of *Mirzaiella* Basir, 1942 and *Chitwoodiella* Basir, 1948. There is also resemblance

between these three forms in the shape of the tail and in the somewhat similar disposition of the caudal papillae. The new parasite differs, however, from the two earlier genera in the structure of the vestibule and the shape, number and arrangement of the caudal papillae. It becomes necessary, therefore, to establish a new genus for the reception of the worm described above. It is proposed to name it

Pteronemella macropapillata gen. nov., sp. nov.

Diagnosis of Pteronemella gen. nov.

Male with straight and spindle shaped body provided with lateral alae; cuticle striated; mouth surrounded by three lips; vestibule divided into two parts; oesophagus consists of a long cylindrical corpus separated from valvular bulb by an ill defined isthmus; tail short, truncated and bearing a terminal process; spicules absent; caudal papillae voluminous, comprising 4 lateral and 2 median pairs.

Female: Unknown.

Genotype: *Pteronemella macropapillata* parasitic in the intestine of *Gryllootalpa africana*.

Locality: Hyderabad, Andhra Pradesh (India).

Type specimen will be deposited in the museum of the Zoology Department, College of Science, Osmania University.

SUMMARY

1. The description of *Indiana grylloalpa* is completed by adding the account of its hitherto unknown male. The genus *Indiana* is defined and separated from the allied genus *Pulchrocephala*.
2. *Travassosinema travassosi* gen. nov., sp. nov. has been described. The new genus has been defined and separated from the allied genera. A new family *Travassosinenematidae* has been proposed to include the new genus along with two other genera *Pulchrocephala* and *Indiana*.
3. *Dudekemia subtruncatum* is described for the first time from India. The systematic position of the species is discussed and it is transferred from *Rhigonema* to *Dudekemia*.
4. A new species *Rondonema spinifera* is described and compared with the allied species.
5. *Singhiella singhi* gen. nov., sp. nov. is described. The genus *Singhiella* is defined and its affinities discussed.

6. *Mirzaiella asiatica* and *Chitwoodiella ovo-filamenta* are recorded for the first time from South India.

7. *Pteronemella macropapillata* gen. nov., sp. nov. is described on the basis of a male.

PART II.

Aoruridae Skrjabin et Schikobalova, 1951

Aorurinae Walton, 1927

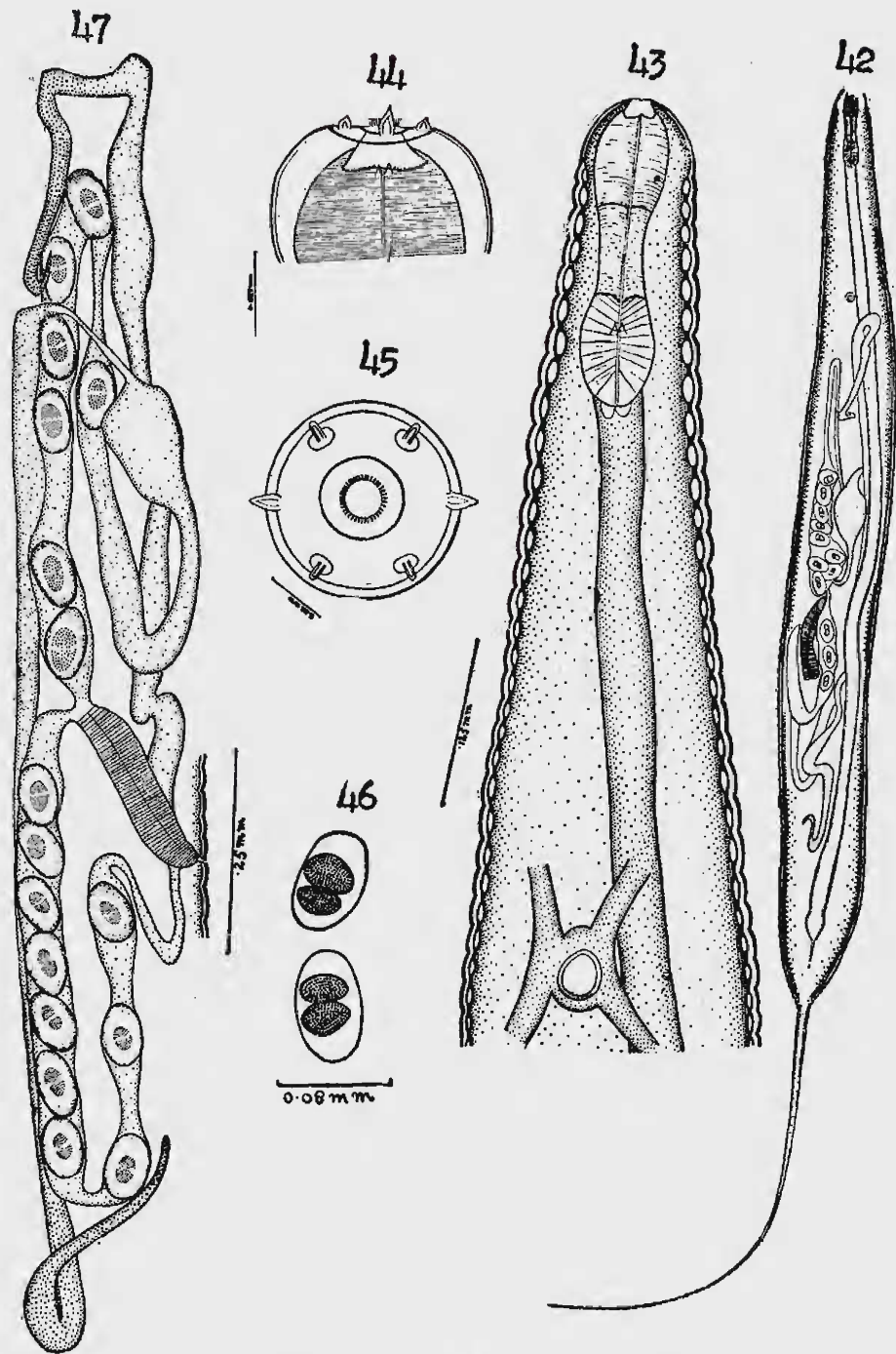
Coronostoma singhi gen. nov., sp. nov.

(Figs. 42-51)

This parasite was recovered twice from the intestine of the millipede, *Spirostreptus* sp., two females were collected on one occasion and one male and one female on another occasion. At first they appeared to belong to the genus *Aorurus* Leidy, 1949, but detailed study of their structure showed that they constituted a new genus.

These are small worms having attenuated and rounded head ends. The male tail tapers evenly terminating in a sharply pointed tip, whilst in the female it bears a long and filiform appendage sharply marked off from the body. The cuticle bears distinct transverse striae and is also characterised by the presence of interstitial punctuations which are prominent in the front region of the body in both sexes.

Female: The females measure 4.6 — 5.21 mm. in length and have a transverse maximum diameter of 0.34 mm. The head is broadly rounded and devoid of cuticular striae; it bears 4 submedian and two lateral papillae which are prominently displayed. The submedians are rounded in shape, whilst the laterally situated ones are conical and pointed. The mouth opening is surrounded by a cuticular rim and is armed with a corona radiata composed of very fine filaments. The excretory pore is found considerably behind the oesophagus, about 0.717 — 0.792 mm. from the head end. It leads into a vesicle which



Coronosioma singhi gen. nov., sp. nov.

Fig. 42. Entire female, ventral view.
 Fig. 43. Anterior end, female, ventral view.
 Fig. 44. Head end, female, ventral view.

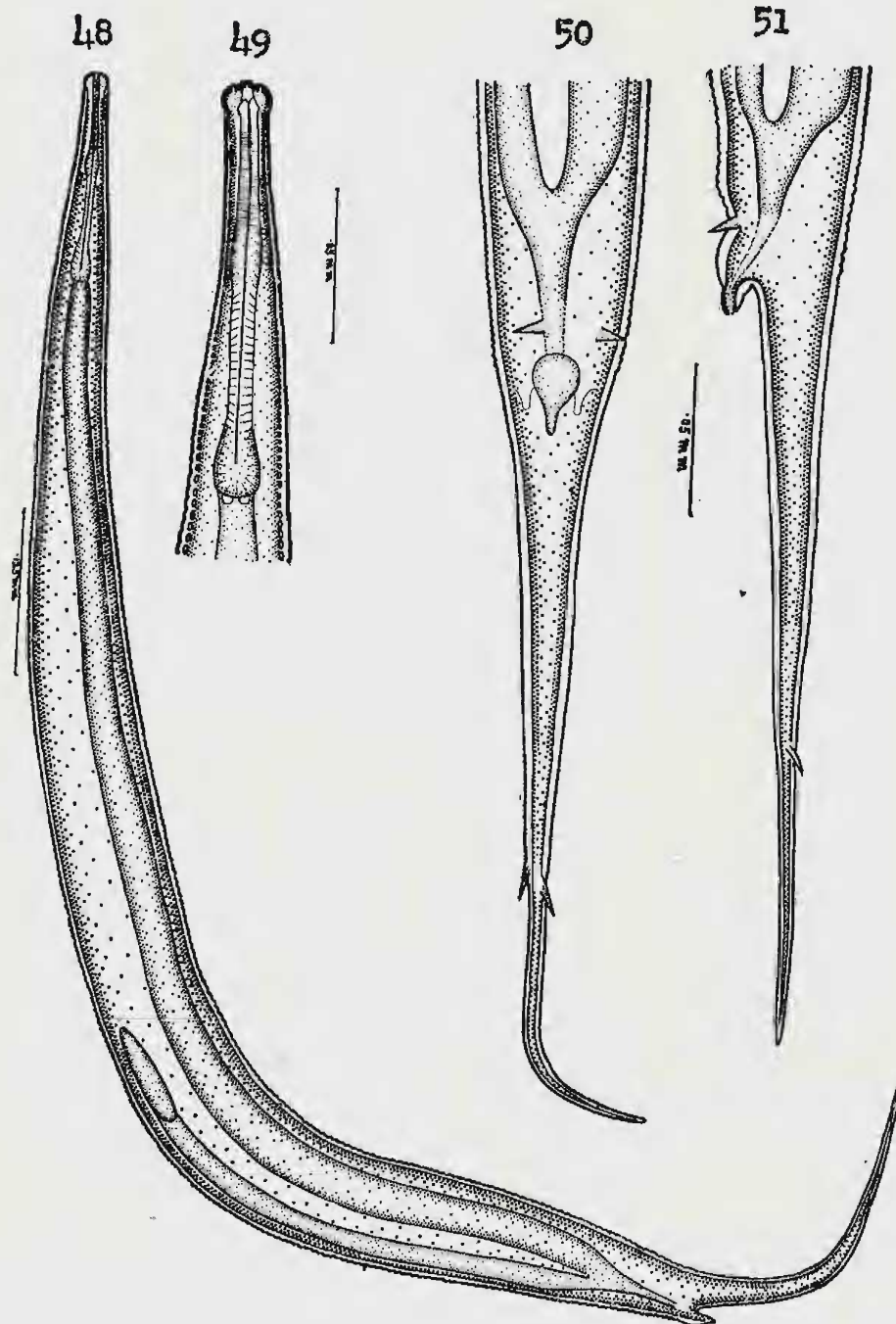
Fig. 45. End on view, female.
 Fig. 46. Eggs.
 Fig. 47. Genitalia, female.

is connected with two anterior and two posterior canals thus forming a "H" type excretory system. The mouth opens into a wide buccal vestibule, 0.012 mm. long by 0.025 mm. wide. In addition to the teeth formed at the entrance to the oeso-

phagus the floor of the vestibule is lined with minute spines, seen only under high magnification. The oesophagus consists of an anterior pseudo bulb and a posterior valvular bulb, such as occur in *Aorurus* species. The two bulbs, measuring 0.07

mm. by 0.05 mm. and 0.1 by 0.04 mm. respectively, are joined together by a short and wide isthmus which is 0.06 mm. long and 0.04 mm. wide. Oesophago-intestinal valves are found at the junction of oesophagus with the intestine. The latter, without expanding into a cardium at its

anterior end, maintains a uniform thickness of 0.04 mm. throughout its length. The tail forms a short conical portion about 0.132 mm. long followed by a sharply marked off filiform appendage measuring 1.8 mm. in length. The vulva which is 2 mm. from the anterior end being with-



Coronostoma singhi gen. nov., sp. nov.

Fig. 48. Entire male, lateral view.
Fig. 49. Anterior end, male, lateral view.

Fig. 50. Posterior end, male, ventral view.
Fig. 51. Posterior end, male, lateral view.

out prominent surrounding lips is flush with the body surface. It opens into an anteriorly directed vagina which is connected with the two uteri running in the opposite directions. The anterior uterus at its junction with the oviduct expands into a sac-like receptaculum seminis; the corresponding enlargement of the other uterus, however, could not be traced. Both the ovaries are reflexed at their tips; the anterior one extending into the vicinity of the excretory vesicle, the posterior one being closer to the hind end of the intestine. The eggs measure 0.078 — 0.09 mm. long and 0.048 — 0.053 mm. broad,

Male: The single male specimen available for study measured 1.35 mm. in length and 0.107 mm. in maximum thickness. The cuticular striae are 0.003 mm. apart and the interstitial punctuations found in it are not so prominent as in the case of the female. The head is knob-like with rounded sides. It bears 4 submedian and 2 lateral papillae. The corona radiata surrounding the mouth could be observed only under high magnification. The oesophagus measures 0.124 mm.; it forms a slight median enlargement and a valvular terminal bulb. The single testis runs anteriorly towards the middle of the body where it terminates in a reflexed tip. The anus is 0.24 mm. from the sharply pointed tip of the tail. Spicules and caudal alae are lacking. The caudal papillae are spine-like in shape and comprises two pairs, one pair preanal and one postanal in position. The preanal pair is located close to the anus about 0.03 mm. in front of it, and the postanal pair is situated considerably posteriorly to the middle of the tail.

Discussion: The new parasite resembles *Aorurus* Leidy, 1849 in general appearance, in the structure of the oesophagus in the female, and the characteristic

shape of the tail in the male. It, however, differs from it in the following features:

- (1) In the new worm the cuticle shows interstitial punctuations not observed in species of *Aorurus*.
- (2) Unlike *Aorurus* a distinct leaf crown, 'corona radiata' projecting through the mouth is found in the new genus.
- (3) There are six papillae surrounding the mouth in the new parasite, whereas *Aorurus* has eight labiopapillae or papillae.
- (4) Distinct teeth occur at the base of the buccal vestibule in the present worm.

In view of the distinguishing feature exhibited by the worm the writer feels justified in establishing a new genus for its reception. It is proposed to name it *Coronostoma* gen. nov. The new species is designated *Coronostoma singhi* after Professor S.N. SINGH.

Diagnosis of Coronostoma gen. nov.

Small worms with rounded head ends and sharply pointed tails in both sexes; cuticle having interstitial punctuations; mouth with corona radiata; head bearing 6 papillae; vestibule with teeth; female tail terminating in filiform appendage; oesophagus with anterior pseudobulb; broad isthmus and terminal valvular bulb; vulva posterior to middle of body. Male with knob-like head and sharply pointed tail; oesophagus with a slight median enlargement and a posterior valvular bulb. Caudal alae and spicules absent; caudal papillae spine-like, one pair preanal and one pair postanal.

Genotype: *Coronostoma singhi* sp.nov.

Host: *Spirostreptus* sp.

Habitat: Intestine.

Locality: Hyderabad, Andhra Pradesh (India).

Type specimens will be deposited in the museum of the Zoology Department, College of Science, Osmania University.

Hammerschmidtella Chitwood, 1932

Hammerschmidtella diesingi
(Hammerschmidt, 1838) Chitwood, 1932
(Figs. 52-53)

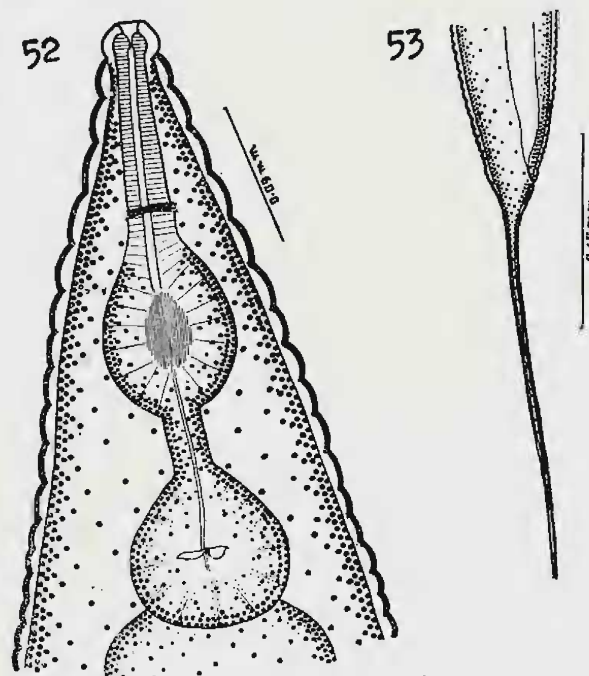
CHITWOOD (1932) established the genus *Hammerschmidtella* designating as its type the worm described by HAMMERSCHMIDT (1838) under the name *Oxyuris diesingi*. This worm was described by various authors under different names which have now become synonyms of *H. diesingi*. HAMMERSCHMIDT himself described it again in 1847 as *Oxyuris blattae orientalis*. *Streptostomum gracille* Leidy, 1850, and *Anguillula macrura* Diesing, 1851, are synonyms of this species. Its generic position had a chequered history as detailed by BASIR (1956).

This parasite occurs in the intestine of cockroaches and has a wide geographical distribution; having been recorded from North and South America, Europe, Russia and North India. The writer on numerous occasions obtained male and female specimens of this species from the rectum of cockroaches in Hyderabad. The principal measurements of material studied are recorded below:

Female: Length, 3.1 — 4.2 mm.; maximum width, 0.23 — 0.32 mm.; oesophagus, 0.36 mm. long (Corpus, 0.1 — 0.13 mm. by 0.02 mm.; pseudo bulb, 0.06 — 0.09 mm. by 0.06 — 0.07 mm.; isthmus, 0.04 mm. by 0.01 — 0.015 mm.; valvular bulb, 0.09 — 0.1 mm. by 0.085 — 0.09 mm.); tail, 1.0 — 1.3 mm. long; vulva, 0.83 — 0.9 mm. from head end, eggs, 0.07 — 0.074 x 0.03 — 0.035 mm.

Male: Length, 0.81 — 0.884 mm.; maximum width, 0.06 — 0.065 mm.; oesophagus, 0.155 mm. long (Corpus, 0.067 mm. by 0.006 mm.; isthmus, 0.048 mm.; bulb, 0.025 mm. by 0.029 mm.); anus to tip of tail, 0.11 — 0.13 mm.; tail, 1/7th of body length; single spicule, 0.0168 mm. long. Caudal papillae, 2 pairs adanal and a single unpaired papilla at the base of tail.

It may be noted that the data given above covers a wider range of measurements than hitherto recorded for this species.



Hammerschmidtella diesingi (Hammerschmidt, 1838) Chitwood, 1932

Fig. 52. Anterior end, female.
Fig. 53. Posterior end, female.

Host: *Periplaneta americana* and *Blattella orientalis*.

Habitat: Rectum.

Locality: Hyderabad, Andhra Pradesh (India).

The genus *Hammerschmidtella* besides its type species *H. diesingi* contains one more species, *H. nayrae* Sanchez, 1947, also parasitic in cockroaches, *Periplaneta americana* in Spain.

The writer on numerous occasions collected from the intestine of Millipeds large numbers of male and female specimens, which turned out to be a new species of the genus.

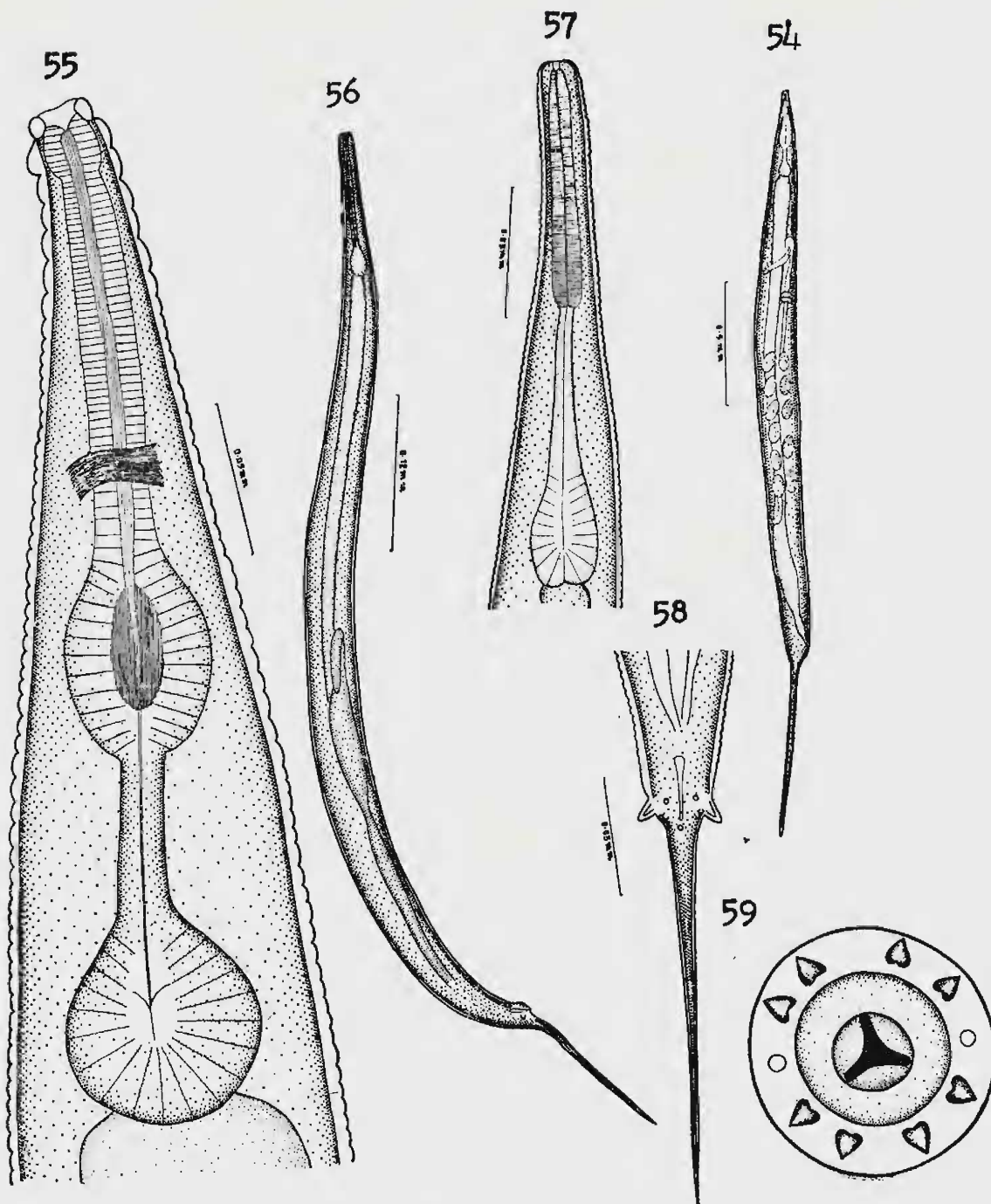
Hammerschmidtella manohari sp. nov.
(Figs. 54-59)

These are small worms with a slender body, the females being roughly three times as long as the males. In both sexes the anterior extremity tapers towards a truncated head end whilst the posterior end bears a sharply pointed caudal appendage. The cuticle bears distinct striations which become more and more prominent towards the head end.

Female: The females measure 3.0 — 3.3 mm. in length and 0.15 — 0.18 mm. in maximum width. The mouth opening is surrounded by eight labiopapillae which are arranged as shown in Fig. 59. In an end on view each papilla appears to have a notched base facing the mouth and a pointed apex directed outwards. The amphids are laterally situated and appear as circular apertures. The cuticle is striated throughout the length of the body. The first annule at the head end is 0.014 mm. and the next five annules measure 0.01 — 0.012 mm. each. The annules in post oesophageal region of the body vary from 8 to 10 μ in width. The mouth leads into a small but wide buccal vestibule, 0.005 mm. long by 0.009 mm. wide. The oesophagus that follows has the structure characteristic of the genus; it consists of a corpus expanding into a pseudobulb, an isthmus and a valvular bulb. The entire oesophagus is about 0.32 — 0.35 mm. long. The slender isthmus is 0.052 — 0.063 mm. corpus measures 0.147 — 0.168 mm. by 0.016 — 0.018 mm. and the pseudobulb 0.056 — 0.084 mm. by 0.046 — 0.056 mm. The slender isthmus is 0.052 — 0.063 mm.

long by 0.008 — 0.012 mm. wide, whilst the valvular bulb has a diameter of 0.062 — 0.069 mm. The nerve ring surrounds the corpus in front of the pseudobulb. The intestine has its anterior end dilated into a cardium. The tail including the caudal appendage measures 0.78 mm. The vulva, which is located at 0.084 — 0.092 mm. from the head end, divides the body in the ratio of 3:7. The vagina at first runs transversely in an arch-like manner and then proceeds backwards to join the common uterine sac. The latter at its hind end gives origin to the two oviducts which are reflexed and continued into the coiled ovaries which extend in front half way up between the vulva and the oesophageal bulb. The eggs are thin-shelled and ovoid, measuring 0.075 — 0.084 mm. long by 0.036 mm. wide.

Males: The males measure 0.81 — 0.96 mm. in length and 0.042 mm. in maximum width attained at about the middle of the body. The striae near the anterior end are 0.002 mm. apart, whilst those found at about the middle of the body are set at intervals of 0.004 mm. The oesophagus is 0.12 — 0.131 mm. long and consists of a cylindrical corpus. The three parts of the oesophagus, corpus, isthmus and bulb measure 0.055 — 0.067 mm. by 0.009 — 0.012 mm., 0.036 — 0.042 mm. by 0.007 mm. and 0.03 — 0.035 mm. by 0.015 — 0.018 mm. respectively. The single testis extends forwards towards the middle of the body where it ends in a reflexed tip. The anus is 0.12 — 0.132 mm. from the tip of the caudal appendage. Alae are lacking on the tail but caudal papillae are present comprising a pair of preanals, two pairs of adanals and an unpaired median postanal papilla. Of the two pairs of adanal papilla, one pair lies close to the anus and the other pair, which is well developed, projects laterally from the tail. The preanal pair is situated in **front** of



Hammerschmidtella manohari, sp. nov.

Fig. 54. Entire female, lateral view.
 Fig. 55. Anterior end, female, lateral view.
 Fig. 56. Entire male, lateral view.

Fig. 57. Anterior end, male, lateral view.
 Fig. 58. Posterior end, male, ventral view.
 Fig. 59. End on view, female.

the median pair of adanals, whilst the median postanal papilla is located immediately posterior to the anus, at the root of the tail. The single spicule present measures 0.018 mm. in length.

Discussion: The female of the new parasite in possessing a longer tail differs

from *H. nayrae*, whilst it resembles the type species *H. diesingi* in this respect. It can, however, be differentiated from both the species on the following grounds:

- (1) The new worm has comparatively longer corpus and distinctly

narrower pseudobulb than those of either *H. diesingi* and *H. nayrae*.

- (2) *H. manohari* male is slender bodied, whereas male of *H. diesingi* is stouter.
- (3) The male of the present worm has a longer tail than that of *H. diesingi*. The tail is six anal diameters long in the former and only 3 anal diameter in the latter.

Besides differing in the above characters the worm under study also differs from the two known species in various body measurements. It is, therefore, concluded that the worm described herein from the milliped represents a new species. It is proposed to name *Hammerschmidtella manohari* after my colleague Mr. MANOHAR DAS.

Host: *Spirostreptus* sp.

Habitat: Intestine.

Locality: Hyderabad, Andhra Pradesh (India).

Type specimens will be deposited in the museum of the Zoology Department, College of Science, Osmania University.

Blattophilinae Skrjabin et
Schikhobalova, 1951

Blattophila Cobb, 1920

Blattophila suppelaima Basir, 1941
(Figs. 60-68)

BASIR (1941) described this species from the Cockroach, *Supella supellectillum*, in Aligarh. He based his description of the species on the females only. The writer while investigating nematode infestations of the same host in Hyderabad recovered not only females but also males of this species. A very large number of specimens of this particular type of cockroach were dissected and examined throughout the year, and it was found that

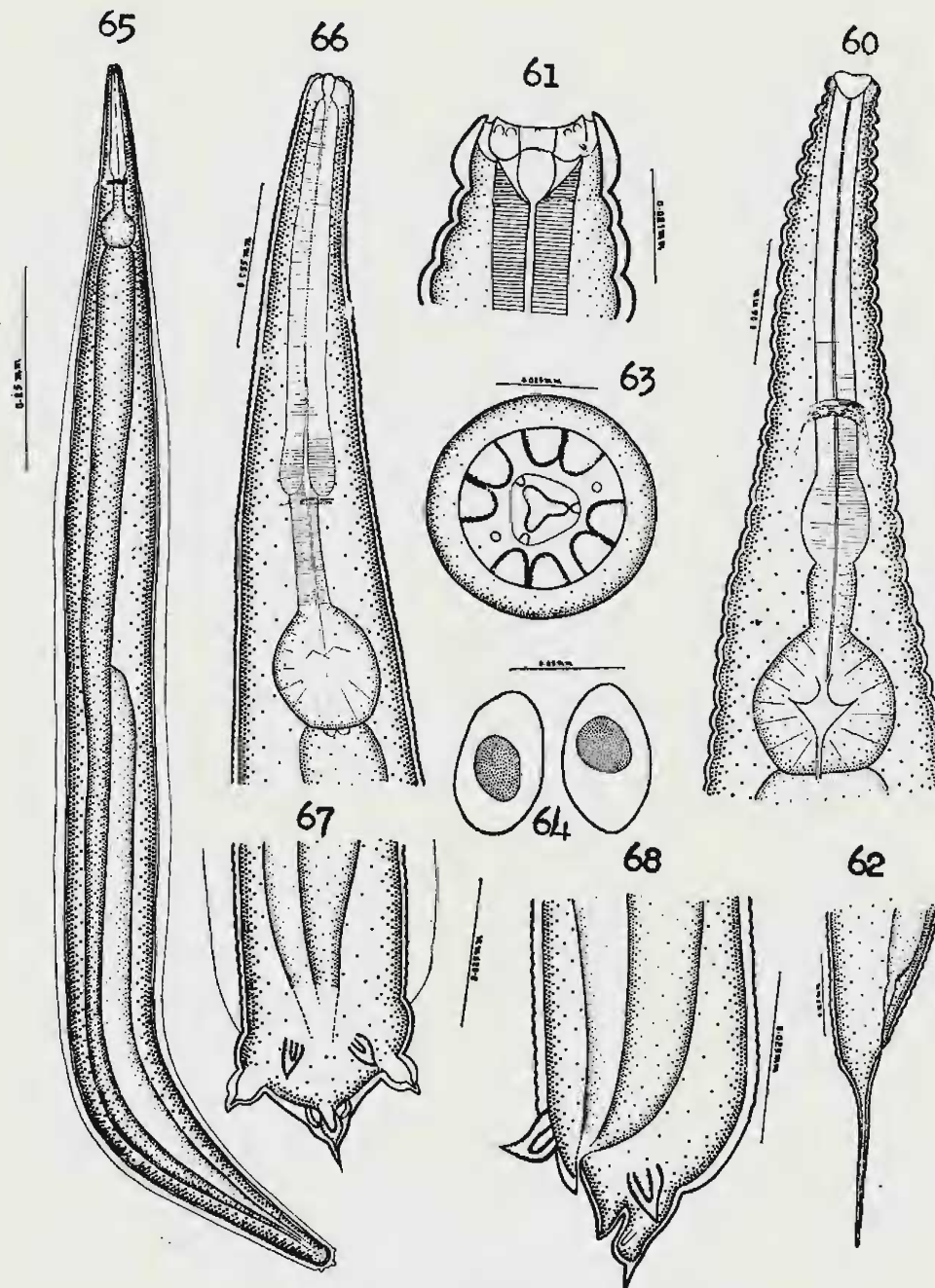
they harboured only *B. suppelaima* and no other nematode parasite. The writer has availed of this opportunity to redescribe the female and give a detailed account of the hitherto unknown male.

These are small worms with attenuated head ends. The tail of the female is provided with a sharply pointed caudal appendage of moderate length. On the otherhand, the male tail is very short and truncated bearing a short median spine.

Female: The females measure 2 — 2.5 mm. in length and 0.28 — 0.3 mm. in maximum transverse diameter. The head is truncated and presents a slight depression in front. Lateral alae are present extending along the length of the body from the level of the terminal oesophageal bulb to the base of the tail. The cuticle bears transverse striae. The first annule at the head end measures 0.02 mm. wide and the succeeding annules in the oesophageal region have a coverage width of 0.01 mm. They gradually increase in width towards the middle of the body where they are 0.02 mm. wide. The terminal mouth is triangular in outline and is surrounded by 8 labiopapillae arranged in pairs. The pore-like small amphids are situated laterally as shown in Fig. 63. The mouth opens into a short and wide buccal cavity which extends into the front end of oesophagus as a funnel-like depression. The nerve ring surrounds the oesophagus at a distance of 0.18 mm. from the head end. The cylindrical corpus terminates in a swollen bulb-like enlargement which is connected by means of a well differentiated isthmus to the terminal valvular bulb. The corpus is 0.21 mm. long by 0.021 mm. wide and its posterior enlargement 0.04 mm. by 0.032 mm. The isthmus measures 0.042 x 0.025 mm. and the valvular bulb 0.075 — 0.084 mm. in diameter. The entire oesophagus thus attains a length of 0.315 mm. approximately. The

front end of the intestine forms a distinct cardium. The short tail including the sharply marked off caudal appendage measures 0.29 mm. in length. The vulva is located anterior to the middle of the body, at a distance of 0.95 mm. from the head end. It opens into a strongly curved

vagina leading into a long uterine sac which posteriorly extends midway between the vulva and the anus. The oviducts arise from the hind end of the uterine sac; one runs straight in front from its point of origin, whilst the other one proceeds posteriorly for some distance be-



Blattophila suppellaima Basir, 1941

Fig. 60. Anterior end, female, lateral view.
 Fig. 61. Head end, female, ventral view.
 Fig. 62. Posterior end, female, lateral view.
 Fig. 63. End on view, female.
 Fig. 64. Eggs.

Fig. 65. Entire male, ventral view.
 Fig. 66. Anterior end, male, lateral view.
 Fig. 67. Posterior end, male, ventral view.
 Fig. 68. Posterior end, male, lateral view.

fore it takes a turn to run in the anterior direction. The two oviducts are continued anteriorly into the ovaries in front of the vulva which are thrown into coils with their tips directed backwards.

Male: The male measures 1.18 — 1.3 mm. in length and 0.108 — 0.114 mm. in maximum width. The body is provided with lateral alae which start from the tail end extending forwards as far as the hind end of the oesophagus. The cuticle is striated, the first annule at the head end being 0.004 mm. wide. The nerve ring crosses the corpus of the oesophagus immediately posterior to its hind end; it is 0.14 mm. from the head end. The oesophagus has the same structure as in the female with the difference that the posterior enlargement of the corpus is not well differentiated. The entire oesophagus is 0.22 mm. long, whilst its constituent parts, corpus, isthmus and terminal bulb, measure 0.14 x 0.025 mm., 0.36 x 0.02 mm. and 0.05 mm. in diameter respectively. The testis lies closely applied to ventral wall of the intestine and extends in front to the middle of the body. The tail terminates abruptly and bears a sharp median spike. There are three pairs of caudal papillae, one pair is preanal and two pairs postanal in position. The preanal pair is located close to the median line whilst the large postanal pair projects prominently from the lateral borders of the tail. The 2nd pair of postanal papillae are small in size and placed on the sides of the minute caudal process. Spicules are lacking, but a sharply pointed preanal projection is present.

Host: *Supella supellectillum*.

Habitat: Rectum.

Locality: Hyderabad, Andhra Pradesh (India).

The male type specimens will be deposited in the museum of the Zoology

Department, College of Science, Osmania University.

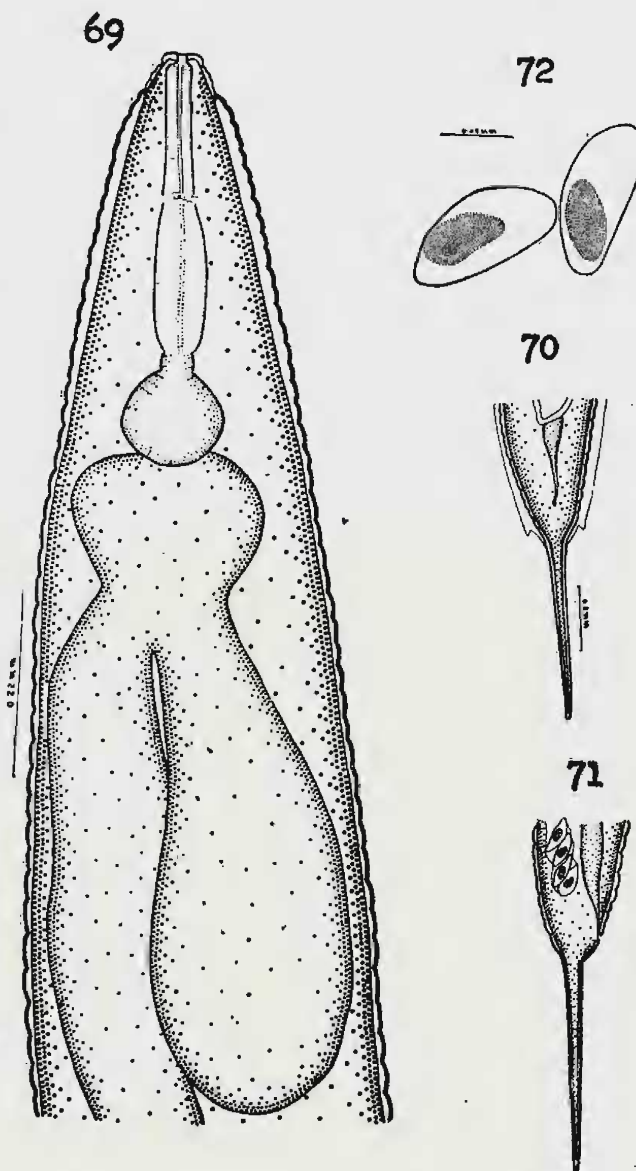
Leidynema Schwenk (in Travassos, 1929)

Leidynema appendiculata (Leidy, 1850)

Chitwood, 1932

(Figs. 69-72)

(Synonyms: *Anguillula appendiculata* Leidy 1850; *Thelastomum appendiculatum* Leidy, 1850; *Oxyuris blattae* (Hammerschmidt, 1847) Galeb, 1878; *Lei-*



Leidynema appendiculata (Leidy, 1850)
Chitwood, 1932

Fig. 69. Anterior end, female, lateral view.
Fig. 70. Posterior end, female, ventral view.
Fig. 71. Posterior end, female, lateral view.
Fig. 72. Eggs.

Leidynema blattae orientalis (Hammerschmidt, 1847) Schwenk, 1929).

Several specimens of the Cockroach, *Blatta orientalis*, dissected and examined by the writer for nematode infections, yielded female worms of this species. This is the first time that *Leidynema appendiculata* is recorded from India. The principal measurements of the material studied are given below.

Female: Length, 2.73 — 4.43 mm; maximum width, 0.11 — 0.2 mm; oesophagus, 0.486 mm. long; nerve ring, 0.162 mm. from head end; length of intestinal diverticulum, 0.67 — 0.8 mm; vulva, 1.5 mm. from head end; tail, 0.76 — 0.85 mm. long; egg, 0.08 — 0.09 mm. by 0.03 mm.

Host: *Blatta orientalis*.

Habitat: Intestine (Rectum).

Locality: Hyderabad, Andhra Pradesh (India).

SUMMARY

1. *Coronostoma singhi* gen. nov., sp. nov. has been described. The new genus has been defined and its systematic position discussed.
2. A new species *Hammerschmidtella manohari* has been described and compared with the related species.
3. The species *Hammerschmidtella diesingi* has been recorded from South India.
4. The description is given of the hitherto unknown male of *Blattophila suppellaima* and the species is redescribed.
5. *Leidynema appendiculata* is reported for the first time from India.

PART III

Thelastomatidae Travassos, 1929

Thelastomatinae Travassos, 1929

Thelastoma Leidy 1849

Thelastoma indica sp. nov.

(Figs. 73-76)

This species is a common parasite of the millipede *Spirostreptus* species. The

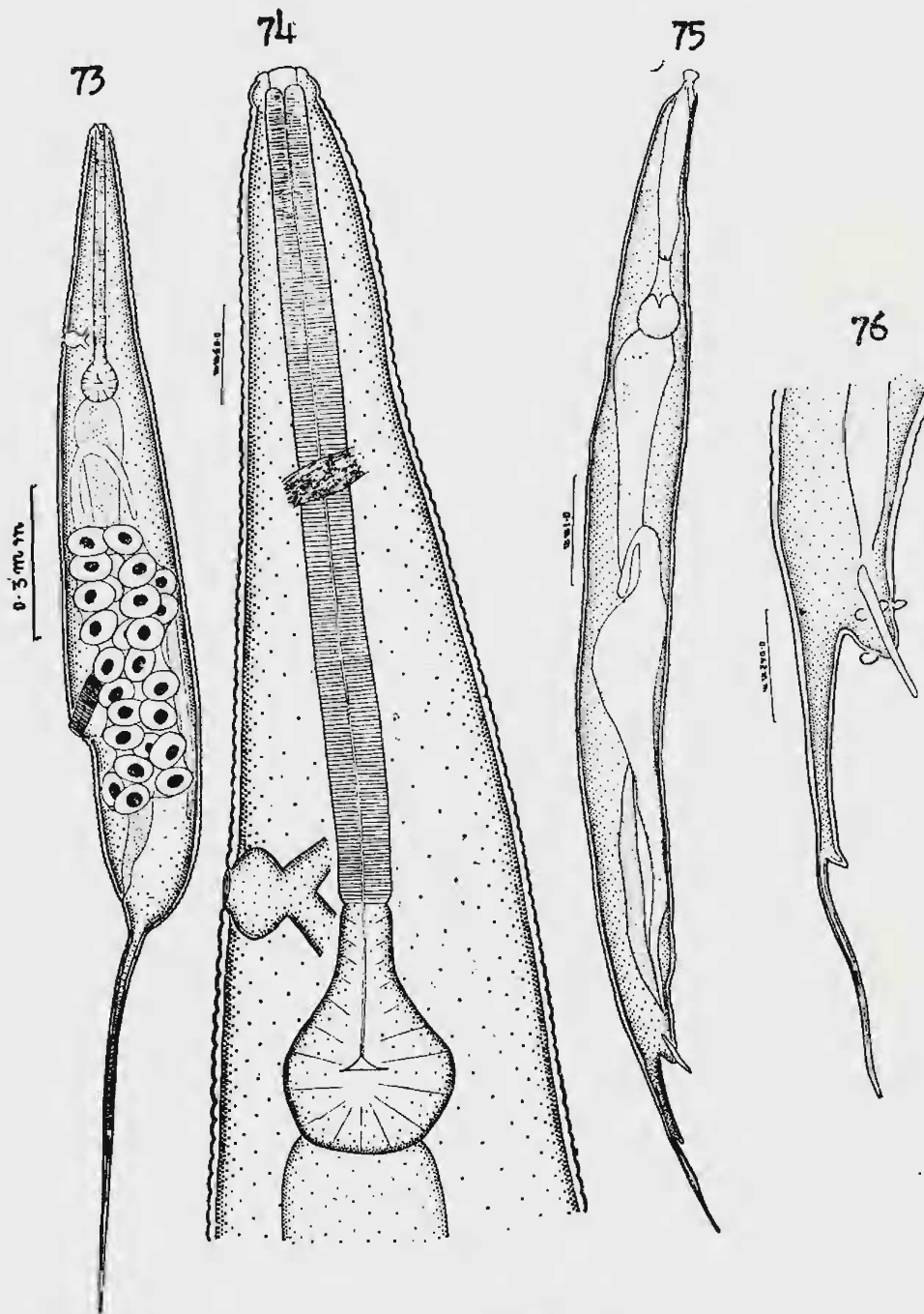
writer found the millipedes infected cent percent with this parasite. The material collected consists of both males and females.

These are small worms, the females having an evenly tapering anterior extremity and a filiform tail about 1/3rd of the body length. In the male also the body tapers both in front and behind, the filiform tail, however, occupying about 1/6th of the body length. The cuticle is transversely striated.

Female: The females vary in length from 1.92 — 2.5 mm. and in greatest width from 0.21 — 0.24 mm. The cuticle is striated throughout the length of the body, the annules measuring 0.009 — 0.014 mm. wide in the anterior region of the body and 0.008 — 0.009 mm. at about the middle of the body. The mouth is surrounded by 8 labiopapillae, the amphids, however, are difficult to observe. The mouth opens into a small vestibule, measuring 0.014 mm. by 0.008 mm; it opens into the oesophagus which consists of a long cylindrical corpus, a small isthmus, and spherical valvular bulb. The three parts — corpus, isthmus and bulb — measure 0.420 — 0.456 by 0.03 — 0.036 mm., 0.024 — 0.03 mm., and 0.09 — 0.108 mm. in diameter respectively. The entire oesophagus thus attains a length of 0.59 mm. The nerve ring surrounds the corpus in its anterior half, and the excretory pore is located immediately anterior to the level of the isthmus, at 0.044 mm. from the head end. The intestine at its anterior end dilates into a slight expanded cardium. The vulva is placed at about the equatorial plane; it lies at a distance 1.11 — 1.12 mm. from the head end. The body narrows suddenly behind the vulva. The vagina runs anteriorly from the vulva and opens into the common uterine sac. This in turn is connected with the ova-

ries by means of short oviducts. The anterior ovary lies close to the intestinal cardiacum whilst the posterior one stretches about half way between the vagina and anus. The eggs are oval in shape and measure 0.06 — 0.065 mm. by 0.03 — 0.04 mm.

Male: The males are smaller than the females, measuring 0.97 — 1.92 mm. in length and 0.09 — 0.102 mm. in greatest width. The annules are 0.004 mm. wide near the head end and 0.005 at about the middle of the body. The males were in a poor state of preservation and



Thelastoma indica sp. nov.

Fig. 75. Entire male, lateral view.

Fig. 76. Posterior end, male, lateral view.

Fig. 73. Entire female, lateral view.

Fig. 74. Anterior end, female, lateral view.

hence the head structure could not be studied in detail. The oesophagus is 0.247 — 0.276 mm. long; its corpus measuring 0.222 — 0.280 mm. by 0.012 — 0.016 mm., isthmus, 0.006 mm. by 0.008 mm. and the valvular bulb, 0.042 mm. by 0.03 mm. The nerve ring crosses the oesophagus at a distance of 0.078 mm. from the head end. The front end of the intestine forms a cardium which is markedly wider than oesophageal bulb. The testis extends forwards beyond the middle of the body to terminate in a reflexed tip. The filiform tail which is sharply marked off from the body measures 0.168 mm. in length, occupying about 1/6th of the body length. The caudal alae are lacking but there are 5 pairs of caudal papillae. Of the latter 2 pairs of preanals and 2 pairs of postanals lie close to the anus, whilst the last pair projects prominently from the middle of the tail. The single spicule present measures 0.052 mm. in length.

Discussion: The female of the new parasite in having the excretory pore located anterior to the oesophageal bulb and being provided with a tail about 1/3rd the body length resembles the species *Thelastoma pachyjuli* (Parona, 1896) and *Thelastoma pteroton* Dollfus, 1952. It can, however, be differentiated from the latter owing to the absence of alae on the body of the male. On the other hand it can be also excluded from *T. pachyjuli* on the following grounds;

(1) The female of the new parasite has a comparatively long corpus which is about 7 times the length of the valvular bulb, whereas *T. pachyjuli* female has a relatively short corpus which is only 4½ times as long as the bulb.

(2) Male tail is distinctly filiform in the worm under study, whereas that of

T. pachyjuli is about one and a half times thicker.

(3) The spicule differs in length in the two species; it is 52 μ long in the present worm and 35 μ in the *T. pachyjuli*.

(4) Both the sexes of the newly found worm are thick than those of *T. pachyjuli*.

As a result of these differences it is concluded that parasite described above is new to Science. It is proposed to name it *Thelastoma indica* n. sp.

Host: *Spirostreptus* sp.

Habitat: Intestine.

Locality: Hyderabad, Andhra Pradesh (India).

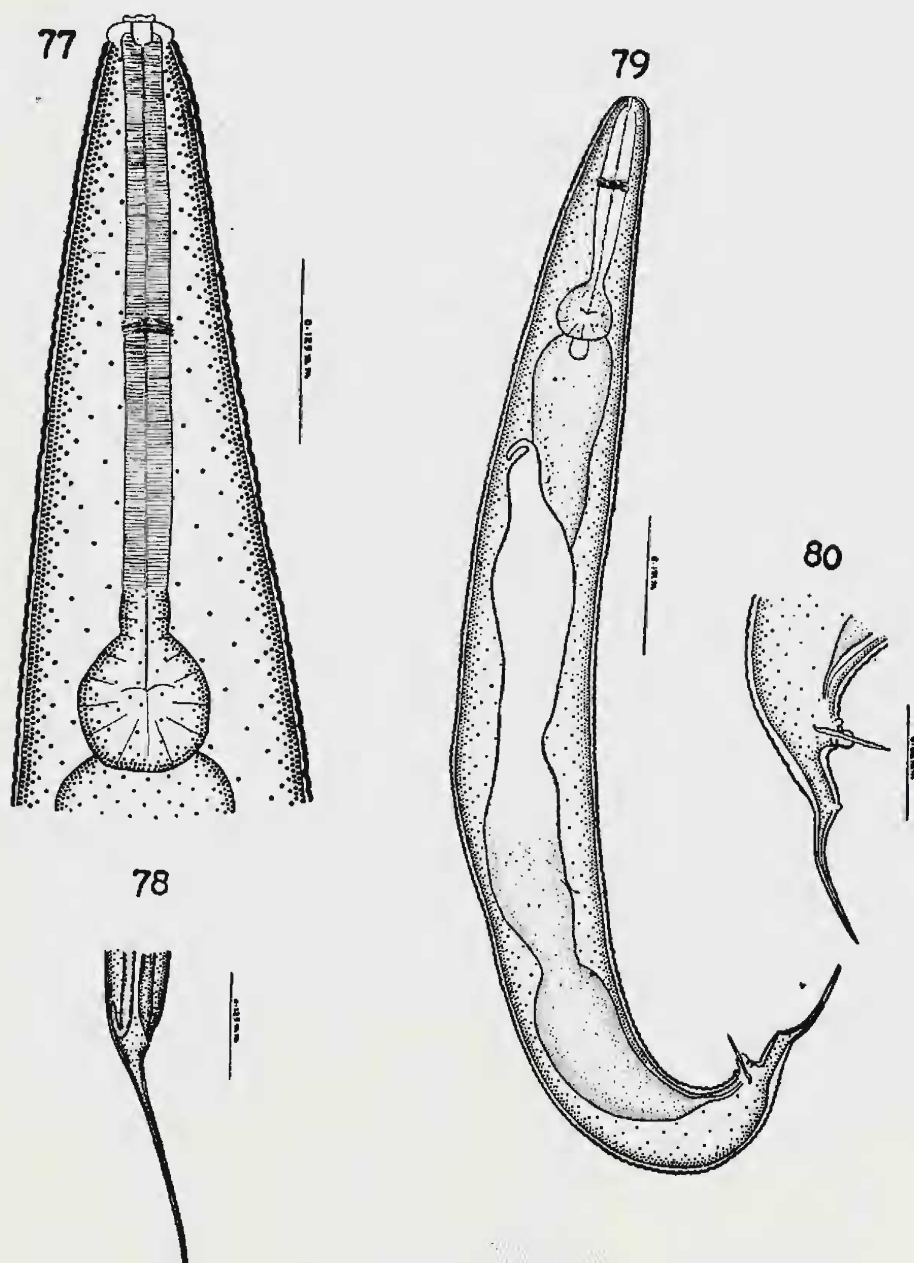
Type specimens will be deposited in the museum of the Zoology Department, College of Science, Osmania University.

Schwenkiella Basir 1956

BASIR (1956) established this genus with *Schwenkiella robustum* (Leidy, 1850) as its type. He transferred to this genus *Thelastoma* species having excretory pore posterior to the base of the oesophagus. Besides the type species *Thelastoma icemi* and *Thelastoma longicaudata* were also transferred by him to this genus.

Schwenkiella icemi (Schwenk, 1926)
Basir, 1956
(Figs. 77-80)

A few male and a few female specimens of this species were collected by the writer from the rectum of the Cockroach, *Periplaneta americana*. This worm was described by BASIR (1940) as a new species under the name *Thelastoma ali-garhica*. But subsequently in 1956 the



Schwenkiella icemi (Schwenk, 1926) Basir, 1956

Fig. 77. Anterior end, female, lateral view.
Fig. 78. Posterior end, female, lateral view.

Fig. 79. Entire male, lateral view.
Fig. 80. Posterior end, male, lateral view.

author placed this worm under the species *Schwenkiella icemi* as its synonym. As a result of his detailed study of the parasite the writer also has come to the same conclusion. The worm is here recorded for the first time from South India and the principal measurements of specimens studied are noted below:

Female: Length, 1.76 — 3.335 mm; maximum width, 0.22 — 0.3 mm; cuti-

cular annules, 0.008 — 0.012 mm; excretory pore 0.454 mm. from head end; buccal cavity, 0.013 — 0.014 mm. by 0.008 — 0.012 mm; oesophagus, 0.36 — 0.46 mm. long; corpus, 0.31 — 0.354 mm. long by 0.4 mm. broad; isthmus, 0.028 mm. long by 0.038 mm. wide; valvular bulb, 0.072 — 0.1 mm. in diameter; nerve ring, 0.12 — 0.186 mm. from head end; vulva, 0.92 — 1.6 mm. from head

end; tail, 0.48 mm. long; eggs, 0.071 — 0.076 mm. long by 0.052 — 0.054 mm. wide.

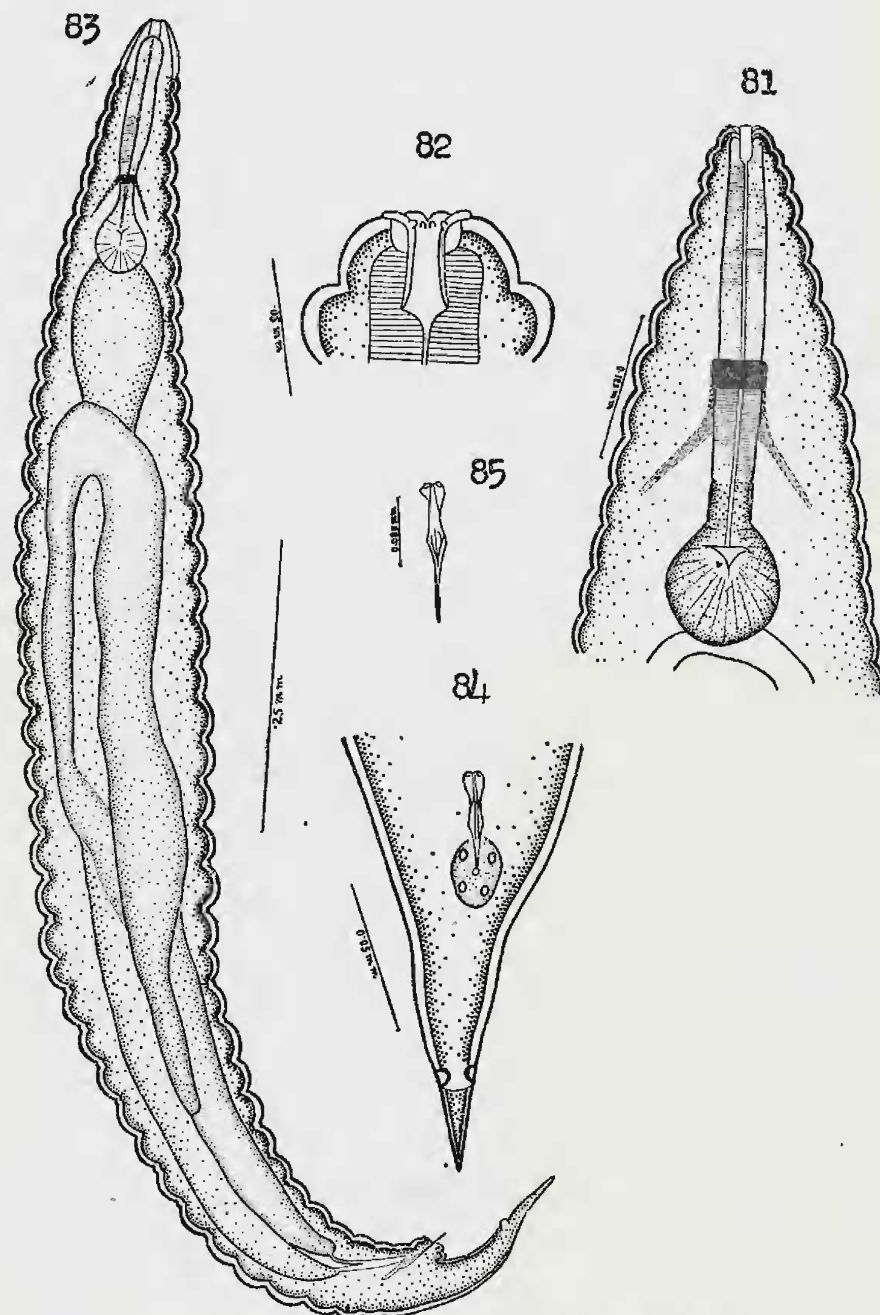
Male: Length, 0.842 — 1.15 mm; maximum thickness, 0.071 — 0.11 mm; cesophagus, 0.154 — 0.186 mm. long; corpus, 0.111 — 0.13 mm. long by 0.026 mm. wide; isthmus, 0.012 — 0.014 mm. long by 0.008 — 0.01 mm. wide; bulb, 0.031 — 0.039 mm. by 0.042 — 0.05 mm;

tail, 0.12 — 0.15 mm. long; spicule length, 0.04 — 0.05 mm; caudal papillae comprising 3 pairs, one pair preanal and two postanal.

Host: *Periplaneta americana*.

Habitat: Rectum.

Locality: Hyderabad, Andhra Pradesh (India).



Gryllophila skrjabini (Sergiev, 1923) Basir, 1956

Fig. 81. Anterior end, female, lateral view.
Fig. 82. Head end, female, lateral view.

Fig. 83. Entire male, lateral view.
Fig. 84. Posterior end, male, ventral view.
Fig. 85. Spicule.

Gryllophila Basir, 1942
Gryllophila skrjabini (Sergiev, 1923)
 Basir, 1956
 (Figs. 81-85)

(Synonyms: *Thelastoma skrjabini* Sergiev, 1923; *Gryllophila gryllophila* Basir, 1942; *Neyraiella neyrae* Serrano Sanchez, 1947).

BASIR (1942) proposed the genus *Gryllophila* but designated as its type *Gryllophila gryllophila*, which as pointed by him subsequently in 1956, turned out to be a synonym of *Thelastoma skrjabini* Sergiev, 1923. He, therefore, while retaining the name *Gryllophila* for the genus substituted the name *Gryllophila skrjabini* (Sergiev, 1923) for the type species. He also considers *Neyraiella neyrae* Serrano Sanchez, 1947 as synonym of *Gryllophila skrjabini*. The writer is in complete agreement with this view.

On several occasions the writer obtained specimens of this species from the rectum of the field Cricket, *Gryllotalpa africana* in Hyderabad. The principal measurements of the material studied are recorded below.

Females: Length, 2.1 — 2.7 mm; maximum width, 0.3 — 0.33 mm; 1st annule, 0.018 mm., 2nd annule, 0.012 mm. and 9th annule 0.042 mm. wide; buccal vestibule, 0.025 mm. by 0.01 mm; oesophagus, 0.42 mm. long; corpus measuring 0.315 mm. by 0.031 mm., isthmus, 0.042 mm. by 0.027 mm., and bulb 0.1 mm. by 0.09 mm; nerve ring, 0.2 mm. from the anterior end of body; vulva, 1.68 mm. from anterior end of body, dividing body in the ratio of 3:1; eggs, 0.18 mm. by 0.108 mm.

Male: Length, 1.3 mm; maximum width, 0.16 mm; 1st annule 0.042 mm. wide, 2nd annule 0.012 mm. and annules in the middle of body 0.036 mm. wide; oesophagus, 0.21 mm. long; corpus mea-

suring 0.11 mm. by 0.02 mm., isthmus 0.035 mm. by 0.01 mm. and bulb 0.06 mm. by 0.05 mm; tail, 0.14 mm. long; spicule measuring 0.056 mm. in length. Papillae, one preanal and one postanal pair close to anus, and 2 postanal pairs at the base of caudal appendage.

The single spicule of the male when seen in a ventral view (Fig. 85) gives a false impression of being composed of two spicules. This led to the erroneous observation made by SANCHEZ who even proposed a new subfamily *Neyraiellinae* on the basis of 2 spicules supposed to be present.

Host: *Gryllotalpa africana*.

Habitat: Intestine (Rectum).

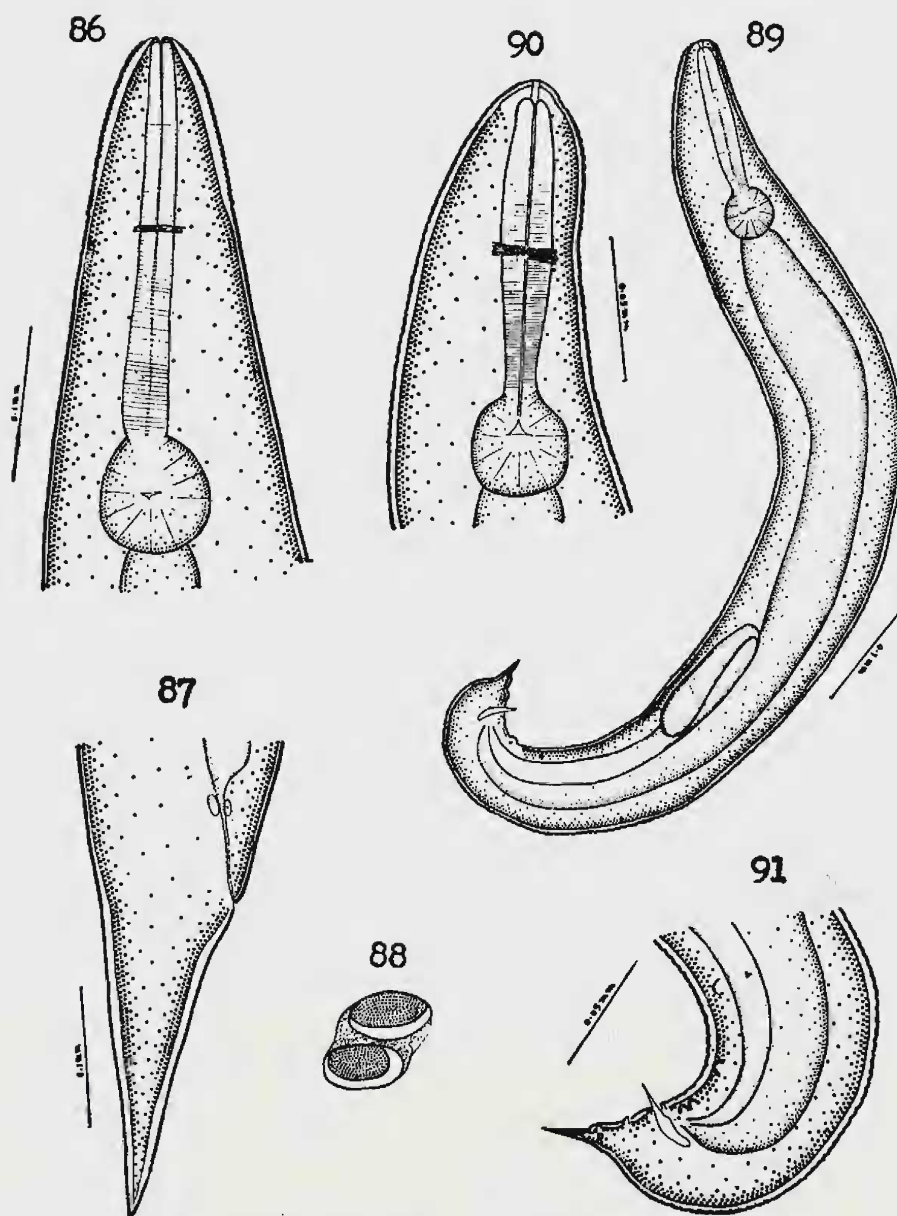
Locality: Hyderabad, Andhra Pradesh (India).

Binema Travassos, 1925

Binema korsakowi (Sergiev, 1923)
 Basir, 1956
 (Figs. 86-91)

(Synonyms: *Oxyuris korsakowi* Sergiev, 1923; *Binema binema* Travassos, 1925; *Gryllocola gryllocola* Basir, 1942; *Binema* (*Binema*) *hispana* Serrano Sanchez, 1947; *Binema* (*Binema*) *medinae* Serrano Sanchez, 1947; *Binema* (*Binema*) *binema* (Travassos, 1925) Serrano Sanchez, 1947).

This species, whose correct systematic position as the type species of the genus *Binema* was finally determined by BASIR (1956), was recorded as a parasite of Crickets from U. S. S. R., Brazil, North India and Spain. The account of this species, however, is based on females only. Numerous female specimens along with a male were recovered from the Cricket, *Gryllotalpa africana* in Hyderabad. The writer takes this opportunity to record the principal measurements of the



Binema korsakowi (Sergiev, 1923) Basir, 1956

Fig. 86. Anterior end, female, lateral view.
 Fig. 87. Posterior end, female, lateral view.
 Fig. 88. Eggs.

Fig. 89. Entire male, lateral view.
 Fig. 90. Anterior end, male, lateral view.
 Fig. 91. Posterior end, male, lateral view.

females examined and to give an account of the hitherto unknown male.

Female: Length, 1.8 — 3.16 mm; maximum width, 0.21 — 0.5 mm; oesophagus, 0.34 — 0.41 mm. long; cylindrical corpus measuring, 0.276 — 0.31 mm. by 0.025 — 0.058 mm; isthmus, 0.012 mm. long, and bulb 0.078 — 0.098 mm. by 0.08 — 0.101 mm; nerve ring, 0.13 — 0.156 mm. from anterior end and surrounding the corpus. Vulva, 1.1 — 1.8

mm. from head end, dividing body in the ratio of 2:3; eggs, 0.055 — 0.064 mm. by 0.03 — 0.041 mm; conical tail, 0.204 — 0.27 mm. long.

Male: The male available for study measures 0.783 mm. in length and 0.11 mm. in maximum thickness. It has a curved body with a slightly flattened head end and a short tail bearing a terminal spine. Lateral alae are present which extend along the entire length of

the body from the tail to the hind end of the oesophagus. The cuticle bears transverse striae, the annules measuring 0.005 mm. in width in the anterior region and 0.006 — 0.007 mm. in the middle of the body. The mouth leads into a small buccal vestibule. The oesophagus, about 0.132 mm. long, consists of a cylindrical corpus separated from the bulb by means of a short and narrow isthmus. The corpus is 0.09 mm. long and 0.016 mm. wide, the isthmus and bulb measuring 0.01 mm. by 0.008 mm. and 0.032 mm. by 0.036 mm. respectively. The single testis forms a distinct loop which extends slightly into the middle third of the body. The tail measures 0.048 mm. in length and bears a sharply pointed terminal spine. There is a single spicule which is expanded in the middle and has a sharply pointed tip; it measures 0.037 mm. in length. The caudal papillae comprise 5 pairs of preanals and 4 pairs of postanals. Of the preanals, 1st to 4th pairs are prominently displayed, the 3rd and 4th pairs lying close together. The 5th pair is very small and lies immediately in front of the anus. The postanal papillae are very small, the first postanal being located immediately posterior to the anus, the other two pairs down the tail. Internal to the 3rd pair lies an additional pair of papillae more ventrally situated.

Host: *Gryllotalpa africana*.

Habitat: Intestine.

Locality: Hyderabad, Andhra Pradesh (India).

Binema ornata Travassos, 1925
(Figs. 92-96)

(Synonyms: *Talpicola talpicola* Basir, 1942; *Binema (Ornata) ornata* (Travassos, 1925); Serrano Sanchez, 1947; *Binema (Ornata) techae* Serrano Sanchez,

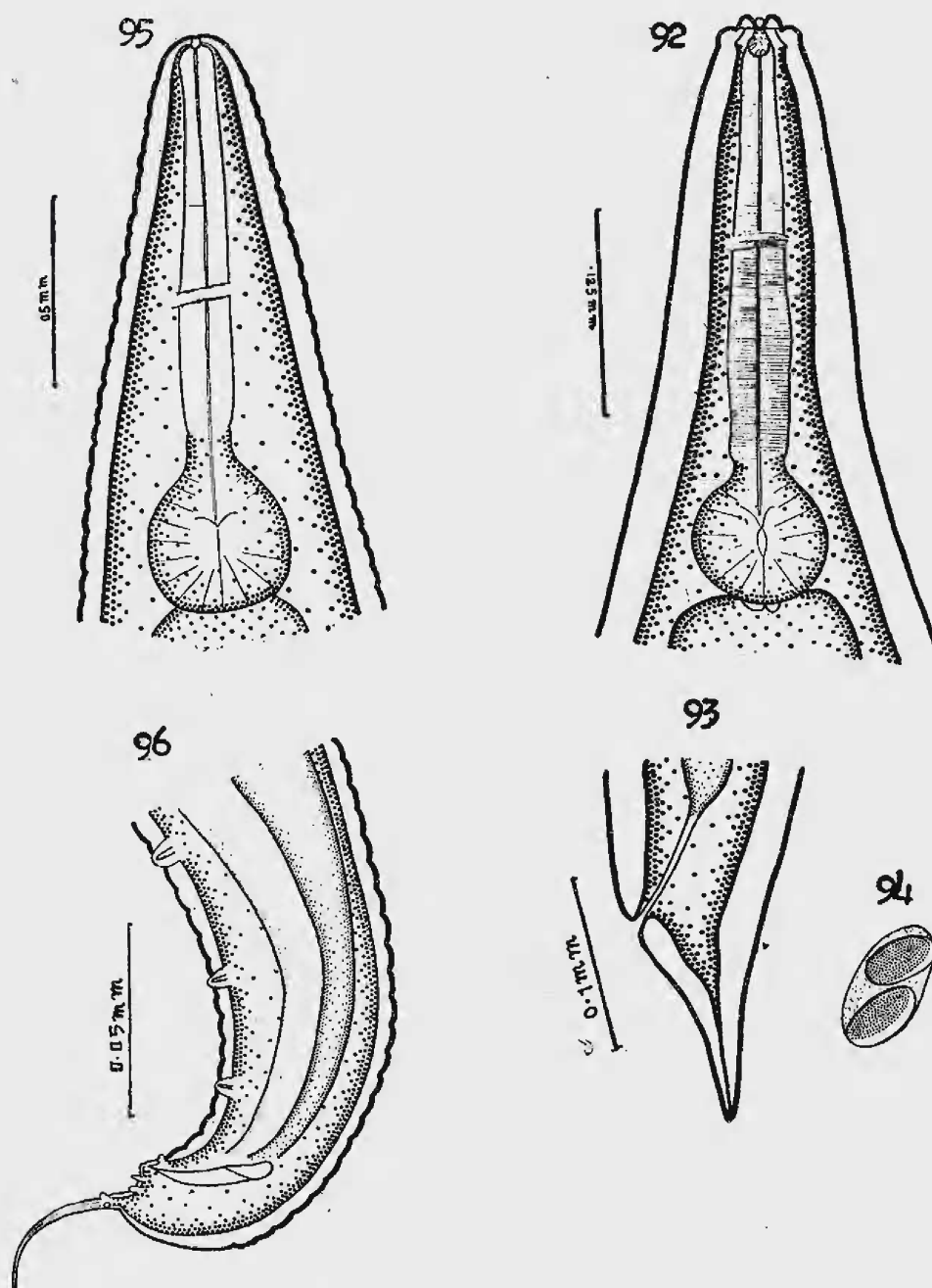
1947; *Binema (Ornata) carmeloi* Serrano Sanchez, 1947).

The material studied consists of both male and female specimens obtained by the writer from the intestine of the Cricket, *Gryllotalpa africana* in Hyderabad. The measurements of the specimens studied are given below and the structure and arrangement of caudal papillae in the male are discussed.

Female: Length, 2.6 — 2.8 mm; maximum width, 0.22 — 0.27 mm; oesophagus, 0.32 — 0.4 mm; corpus measuring, 0.210 — 0.25 mm. by 0.03 — 0.035 mm., isthmus 0.01 — 0.015 and bulb 0.084 — 0.09 mm. by 0.084 — 0.09 mm.; nerve ring 0.128 — 0.139 mm. from anterior end; tail, 0.11 to 0.14 mm. long; vulva, 1.7 — 1.8 mm. from anterior end; eggs, 0.054 — 0.06 mm. long by 0.03 — 0.038 mm. wide.

Male: Length, 0.64 — 0.72 mm; greatest width, 0.056 — 0.067 mm; striations, 0.004 — 0.006 mm. apart; oesophagus, 0.153 mm. long; corpus measuring 0.11 mm. by 0.016 mm., isthmus, 0.011 mm. by 0.013 mm., bulb, 0.031 mm. by 0.04 mm; nerve ring, 0.088 mm. from anterior end; tail, 0.053 mm. long. The single spicule measured 0.03 mm. in length.

TRAVASSOS (1953) described 8 pairs of caudal papillae on the male tail for this species, whereas BASIR gives only 5 pairs. The writer has also observed 8 papillae (Fig. 96). Of the 8 pairs of caudal papillae, 4 pairs are preanal and 4 postanal in position. The first 3 pairs of preanals are distinctly larger than other pairs and equally spaced. The 4th pair of preanal lies close to anus and is very small in size. The 1st and 2nd pairs of postanals are located one behind the other at a short distance from the anus, whilst the remaining 3rd and 4th pairs are placed at the base of the long spike-like caudal process.



Binema ornata Travassos, 1925

Fig. 92. Anterior end, female, lateral view.

Fig. 93. Posterior end, female, lateral view.

Fig. 94. Eggs.

Fig. 95. Anterior end, male, lateral view.

Fig. 96. Posterior end, male, lateral view.

Host: *Grylotalpa africana*.

Habitat: Intestine.

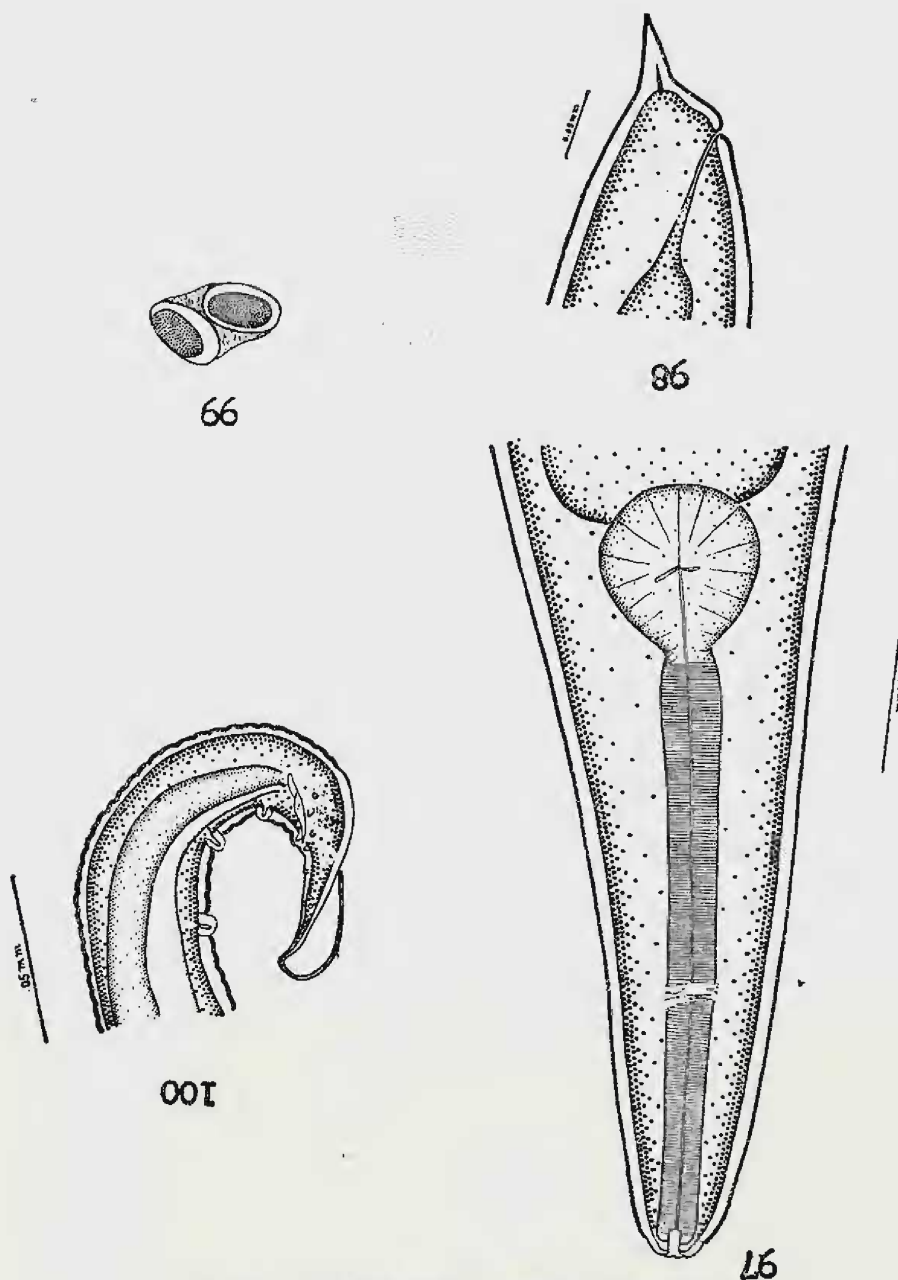
Locality: Hyderabad, Andhra Pradesh (India).

Binema mirzaia (Basir, 1942) Basir, 1956
(Figs. 97-100)

(Synonyms: *Periplaneticola mirzaia*

Basir, 1940; *Periplaneticola periplaneticola* Basir, 1942).

The material studied consists of several females and a single damaged male collected by the writer from the intestine of the Cricket, *Grylotalpa africana*. This species was proposed by BASIR (1940) who based its description on females only. The writer records the species here from



Binema mirzaia (Basir, 1942) Basir, 1956

Fig. 97. Anterior end, female, lateral view.
Fig. 98. Posterior end, female, lateral view.

Fig. 99. Eggs.
Fig. 100. Posterior end, male, lateral view.

South India and adds the description of the hitherto unknown male.

Female: Length, 2.44 — 4.6 mm; maximum width, 0.3 — 0.42 mm; oesophagus, 0.4 — 0.54 mm. long; corpus measuring, 0.3 — 0.408 mm. by 0.038 mm., isthmus 0.012 — 0.02 mm. by 0.02 mm. and bulb 0.09 mm. by 0.12 mm., nerve ring surrounding corpus towards its anterior end, 0.18 — 0.22 mm. from ante-

rior end; tail, 0.09 — 0.11 mm. long; vulva, 3.06 mm. from head end.

Male: The male could not be studied in detail since the anterior portion of its body was damaged and was in a poor state of preservation. The tail, however, revealed well defined characters which serve to differentiate it from the males of the other two species. As shown in Fig. 100 it is sharply conical and bears a

long filiform appendage. The 1st, 2nd and 3rd pairs of preanals are distinct and displayed prominently, whereas the remaining pairs are very small and can be observed only under high magnification. The 4th pair of small preanal papillae is located immediately anterior to the anus and the three pairs of adanals lie lateral to it. The 1st pair of postanals are placed close behind the anus and the 2nd and 3rd postanals posteriorly along the tail. The single spicule present measures 0.024 mm. in length and the tail including the caudal appendage is 0.082 mm. long.

Host: *Gryllotalpa africana*.

Habitat: Intestine.

Locality: Hyderabad, Andhra Pradesh (India).

Discussion: BASIR (1956) recognises only 3 valid species as comprising the genus *Binema*: *B. korsakowi*, *B. ornata* and *B. mirzaia*. The writer is in complete agreement with regard to the synonymy as established by BASIR (1956). That *Binema* males have well defined characters is clear from the accounts of the new males of *B. korsakowi* and *B. mirzaia* and that of *B. ornata* described independently by TRAVASSOS (1953) and BASIR (1956). The males of all three species resemble in general appearance of the tail which is conical and provided with a caudal appendage, and (2) in the structure and characteristic arrangement of 3 pairs of large preanal papillae and 3 pairs of small postanal papillae. But when they are examined side by side with a view to make a close comparison, they show certain well marked differences which serve to differentiate them from one another.

B. mirzaia male has a comparatively long and evenly tapering tail, whilst that of *B. korsakowi* and *B. ornata* are markedly short. The latter two species

can be differentiated from each other by the character of the caudal appendage which is short and spine-like in *B. korsakowi*, whereas it is long and filiform in *B. ornata*. The caudal papillae also show specific differences: *B. korsakowi* has an additional pair of large preanal papillae close to the third pair; *B. mirzaia* possesses 3 small adanal pairs not found in others, whilst *B. ornata* has one additional pair of postanal papillae at the base of the filiform appendage.

Isobinema flagellocerca gen. nov., sp. nov.
(Figs. 101-106)

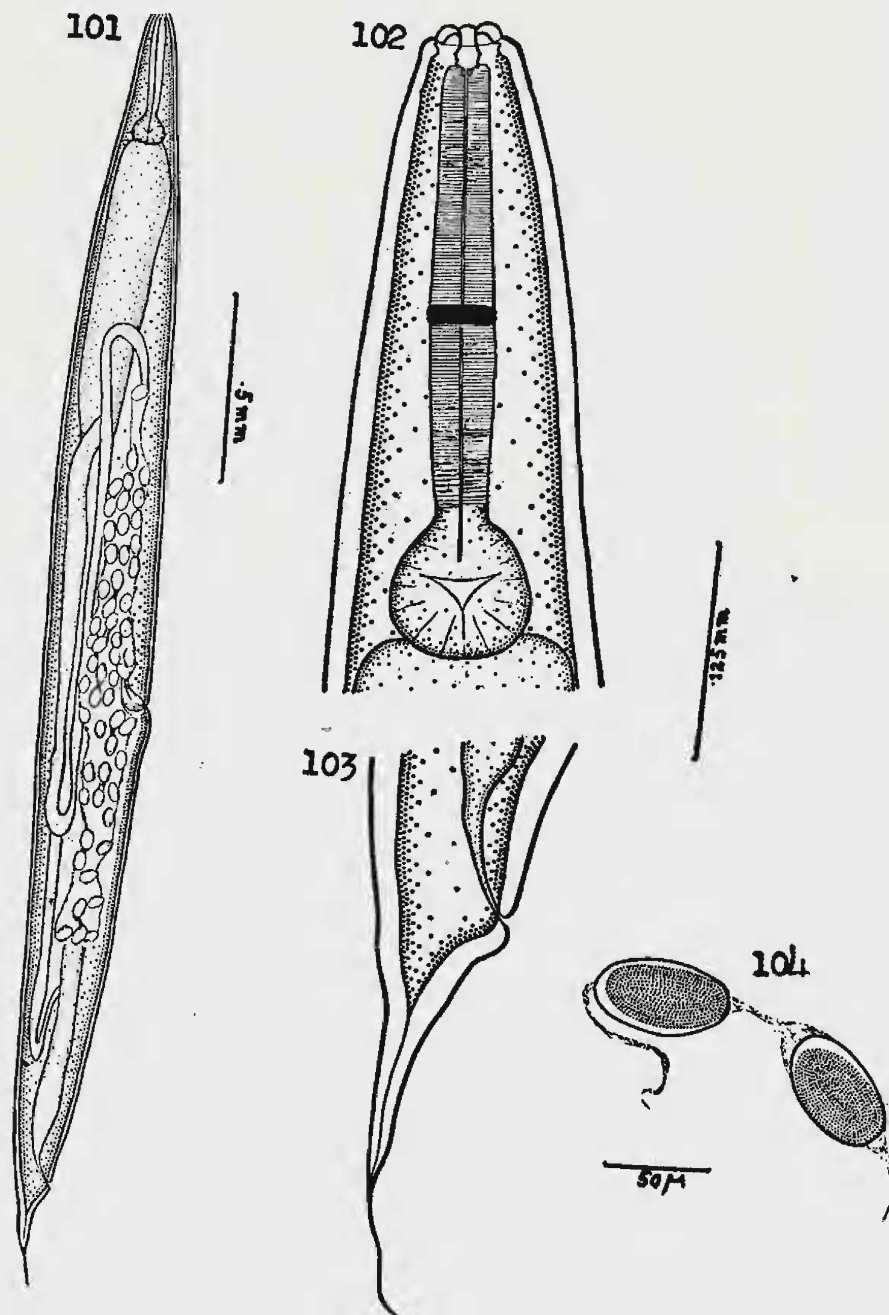
The writer recovered this interesting worm from the intestine of the Cricket, *Gryllotalpa africana*. The material collected consists of a large number of females and a single male.

These are small worms, male being considerably smaller than the female. The body maintains almost an uniform diameter in its middle third whilst it tapers in front and behind. The tail in both sexes bears a flagellate caudal appendage unlike that of any known species of *Binema*.

Female: The females vary in length from 2.82 — 4.09 mm. and in maximum thickness from 0.34 — 0.36 mm. The body is provided with lateral alae which extend throughout its length. The cuticle is smooth and without transverse striations. The mouth, which is surrounded by eight labiopapillae, opens into a vestibule which has strongly cuticularised walls and is partly enclosed by the front end of the corpus; the oesophagus, about 0.35 — 0.45 mm. long, is made up of a cylindrical corpus measuring 0.273 — 0.315 mm. by 0.03 — 0.037 mm., a short isthmus measuring 0.015 — 0.021 mm. by 0.024 mm., and a valvular bulb 0.078 — 0.086 mm. by 0.084 — 0.098 mm.

The intestine forms a distinct cardium occupying the entire width of the body. The vulva, situated at 1.8 — 2.2 mm. from head end, is flush with body surface with vagina running anteriorly from it. The common uterus which joins the vagina is connected at its opposite end to the filiform ovaries by means of short and narrow oviducts. The ovaries termi-

nate in reflexed tips; the anterior one lies at some distance from the valvular bulb, whilst the posterior ovary extends closer to the rectum. The eggs contained in the uterus measure 0.054 — 0.06 mm. by 0.03 — 0.036 mm; they are provided with polar tufts and are released in a chain, a feature in which they resemble the eggs of *Chitwoodiella* Basir, 1948. The tail,



Isobinema flagellocerca gen. nov., sp. nov.

Fig. 101. Entire female, lateral view.

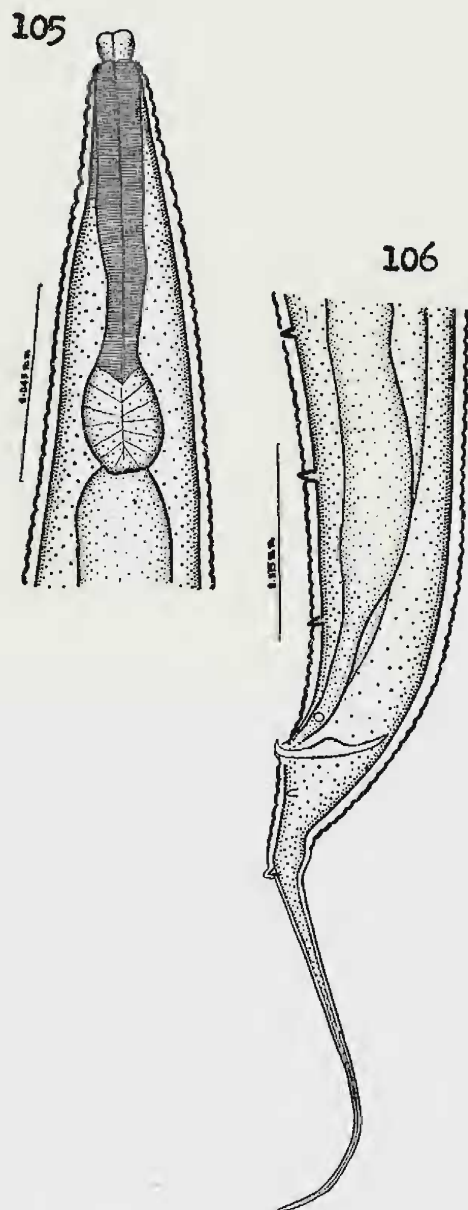
Fig. 102. Anterior end, female, lateral view.

Fig. 103. Posterior end, female, lateral view.

Fig. 104. Eggs.

about 0.21 — 0.256 mm. long, terminates in a flagellated caudal appendage.

Male: The single male available for study measured 0.66 mm. in length and 0.062 mm. in greatest width. Lateral alae are present on the body and the



Isobinema flagellocerca gen. nov., sp. nov.

Fig. 105. Anterior end, male, lateral view.
Fig. 106. Posterior end, male, lateral view.

cuticle is striated, the striae being set at intervals of 0.001 — 0.002 mm. in the oesophageal region and at 0.003 mm. in the middle of the body. The head is

knob-like with rounded sides. In the worm under study the vestibule seems to be everted in the form of a cup. The oesophagus is 0.085 mm. long and is composed of a cylindrical corpus which is swollen at its anterior end, a short isthmus and a terminal valvular bulb. The three constituent parts, corpus, isthmus and bulb, measure 0.058 mm. by 0.01 mm., 0.008 mm. by 0.006 mm. and 0.023 mm. by 0.017 mm. respectively. The tail including the flagellate appendage measures 0.083 mm. in length. There are 4 pairs of preanal and two pairs of postanal papillae. The arrangement of the papillae is somewhat similar to that found in *Binema* species in general. The single spicule present measures 0.022 mm. in length.

Discussion: The parasite described above resembles *Binema* species in general appearance, in the structure and arrangement of the gonads in the female, and in the arrangement of the caudal papillae on the tail of the male. But it is readily distinguishable by the character of the eggs which are released in a chain and not in capsules as has been observed in all species of *Binema* so far described. The characteristic flagellate appearance of the caudal appendage in both sexes is also one of the distinguishing features of the worm under study. The presence of an enlargement at anterior end of oesophageal corpus in the male is another important character of diagnostic value.

As a result of the marked differences exhibited the writer feels justified to constitute a new genus for the reception of the newly found parasite. It is proposed to name it *Isobinema* gen. nov. in view of its close relationship to *Binema* and the specific name *I. flagellocerca* is being given to indicate the characteristic feature of the tail.

Diagnosis of Isobinema gen. nov.

Small worms, males being considerably smaller than females. Mouth surrounded by 8 submedian labiopapillae; buccal cavity partly enclosed by the anterior end of corpus which is swollen in the male; oesophagus composed of a corpus slightly thickened in the middle, a short isthmus, and a terminal valvular bulb; intestine with a distinct cardium; nerve ring immediately posterior to middle of corpus; excretory pore post-oesophageal in position. Vulva slightly posterior to middle of body; uteri divergent; tail of female provided with a flagellate caudal appendage; eggs provided with polar tufts and released in a chain. Male tail with a flagellate caudal appendage; caudal papillae comprising 4 pairs preanal and 2 pairs postanal; a single spicule present.

Genotype: *Isobinema flagellocerca* parasitic in the intestine of *Gryllotalpa africana*.

Locality: Hyderabad, Andhra Pradesh (India).

Type specimens will be deposited in the museum of the Zoology Department, College of Science, Osmania University.

Psilocephala psilocephala gen.nov.,sp.nov.
(Figs. 107-111)

Two females and a single male of this parasite were recovered once from the intestine of the Cricket, *Gryllotalpa africana*. The worm could not be identified with any of the known genera of nematodes parasitic in insects or other Arthropods. As a result of detailed study of its structure it has been possible to determine its systematic position and to assign it to a new genus.

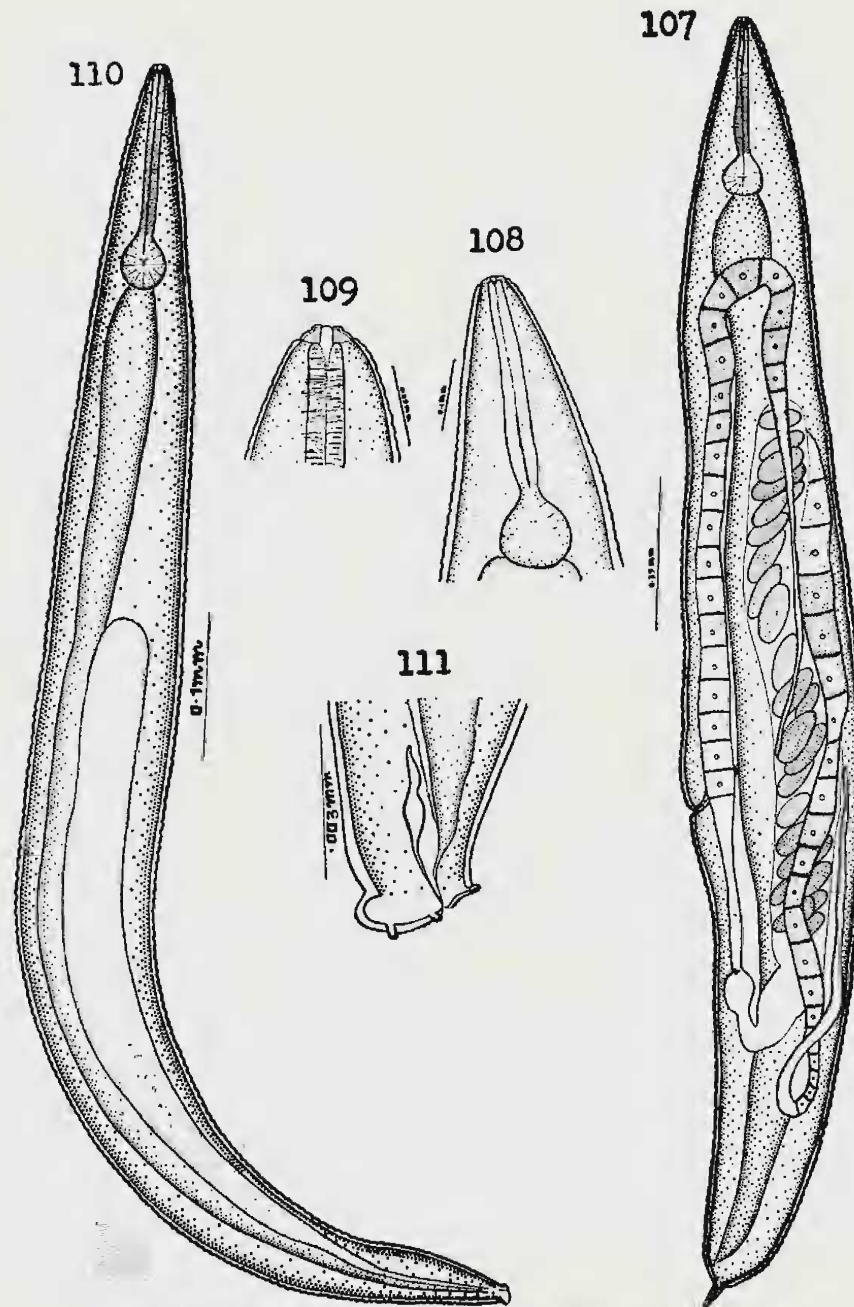
These are small worms having attenuated anterior and posterior ends. The short tail of the female bears a small

terminal spike, whilst that of the male has a somewhat truncated appearance, having its bluntly rounded tip bent dorsally. The cuticle is thin and bears transverse striations throughout the length of the body.

Females: The females measure 2.742 — 2.80 mm. in length and attain a maximum width of 0.3 — 0.33 mm. at the level of the vulva. The cuticular annules are 0.008 mm. wide in the anterior region, their width increasing to 0.01 mm. in the middle of the body. The mouth opens into a small buccal vestibule 0.01 mm. long by 0.007 mm. wide. The oesophagus is 0.418 mm. long and consists of a cylindrical corpus 0.272 mm. long by 0.35 mm. wide, a short isthmus 0.024 mm. long, and a terminal valvular bulb measuring 0.107 — 0.114 mm. in diameter. The front end of the intestine is dilated to form a slight cardium. The vulva, which is devoid of prominent surrounding lips, divides the body roughly in the ratio of 3:2; it is 1.728 mm. from the head end. The vagina runs anteriorly from the vulva to join the common uterus. The latter in its posterior extent reaches half way down towards the tail where it is reflexed and expanded into a receptaculum seminis. This is connected by means of a short oviduct to the anteriorly directed ovary which forms a long loop with its tip lying slightly anterior to the vulva.

The anteriorly directed portion of the common uterus, the corresponding oviduct and the ovary run in a similar course. The two ovaries thus form two distinct loops with their tips lying opposite each other slightly anterior to the level of the vulva. The eggs contained in the uterus are unsegmented measuring 0.102 — 0.103 mm. by 0.06 — 0.064 mm. The short tail with its terminal spike measures 0.103 mm. in length.

Male: The isolated male available



Psilocephala psilocephala gen. nov. sp. nov.

Fig. 107. Entire female, lateral view.

Fig. 108. Anterior end, female, lateral view.

Fig. 109. Head end, female, lateral view.

Fig. 110. Entire male, lateral view.

Fig. 111. Posterior end, male.

for study measured 1.044 mm. in length and 0.114 mm. in maximum thickness. The cuticular annules are 0.004 mm. wide in the oesophageal region and 0.008 mm. in the middle of the body. The buccal cavity is 0.005 mm. long and equally wide. The oesophagus has a total length of 0.144 mm.; its cor-

pus measuring 0.94 mm by 0.1 mm., isthmus 0.011 mm. by 0.006 mm. and bulb 0.034 mm. by 0.029 mm. The single testis extends in front slightly beyond the middle of the body. The single very small spicule present is pointed at both ends; it measures 0.003 mm. in length. As a result of the dorsal bending of the short

tail the anal aperture appears to be terminal in position. There are three pairs of caudal papillae, of which one pair is preanal and two pairs postanal.

Discussion: The parasite described above shows affinities with the genera *Artigasia* Christie, 1934 and *Hystrignathus* Leidy, 1850. It can, however, be differentiated from *Artigasia* owing to presence of double genitalia in its female. In general appearance and in the disposition of the gonads in the female and to some extent in the character of the male tail, the worm under study shows resemblance to the genus *Hystrignathus*. But on close comparison with this genus the present worm would be found to differ from it markedly in the following features:

- (1) Cuticular spines are lacking in the cervical region, whilst they are present in *Hystrignathus* female.
- (2) A very small spicule is present in the male of the new parasite, whilst it is absent in the male of *Hystrignathus*.
- (3) The new parasite possesses a comparatively short oesophagus.

As a result of these marked differences the writer feels justified in establishing a new genus for the reception of the worm described herein. It is proposed to name it *Psilocephala psilocephala* gen. nov., sp. nov. in view of the characteristic difference to *Hystrignathus* to which it is closely akin.

Diagnosis of Psilocephala gen. nov.

Small worms, males with a truncated tail and females having a short tail with a small terminal process offset from the body; cuticle striated; vestibule short;

oesophagus composed of a cylindrical corpus connected by a short isthmus to the terminal valvular bulb. Female without cuticular spines in the cervical region; vulva posterior to middle of body; ovaries form loops with tips lying opposite each other in the vulval region. Male with truncated tail; a single spicule present; anus subterminal; caudal papillae comprise 3 pairs, one preanal and two postanal.

Genotype: *Psilocephala psilocephala* parasitic in the intestine of *Gryllotalpa africana*.

Locality: Hyderabad, Andhra Pradesh (India).

Type specimens will be deposited in the museum of the Zoology Department, College of Science, Osmania University.

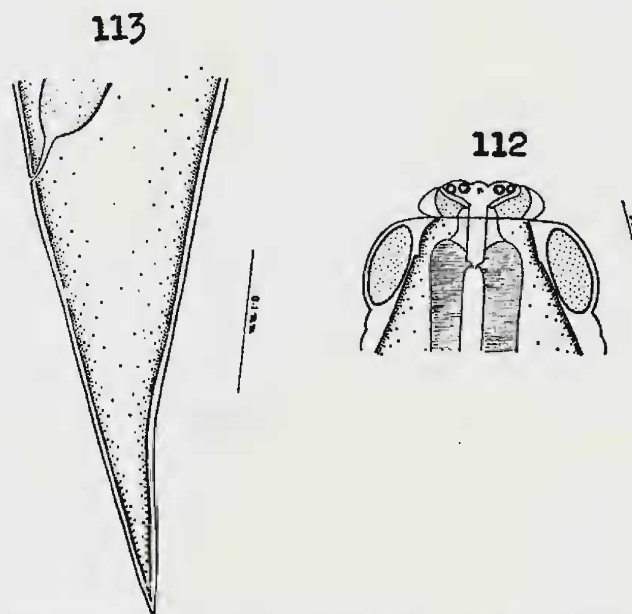
Pseudonymus Diesing, 1857

Pseudonymus hydrophili (Galeb, 1878)

Stiles & Hassall, 1905

(Figs. 112-113)

(Synonyms: *Oxyuris (Helicothrix) hydrophili* Galeb, 1878; *Galebiella gale-*



Pseudonymus hydrophili (Galeb, 1878) Stiles & Hassall, 1905

Fig. 112. Head end, female, lateral view.

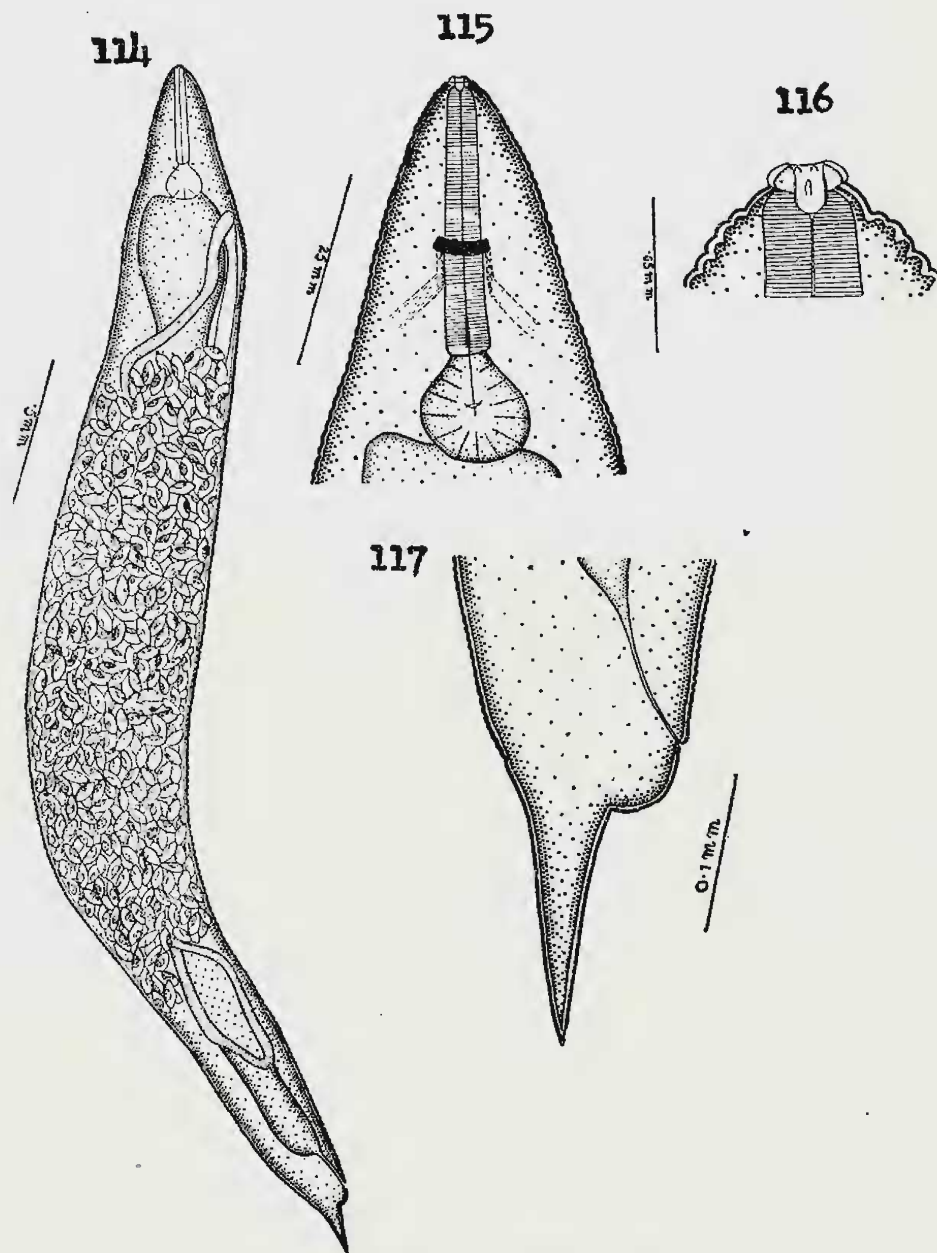
Fig. 113. Posterior end, female, lateral view.

biella Basir, 1941; *Pseudonymus brachycercus* Todd, 1944; *Pseudonymus leptocercus* Todd, 1944).

In April, 1956, this parasite was collected by Professor S.N. SINGH from the rectum of a water beetle examined by him in Vizianagram. The writer is indebted to Professor SINGH for placing the material at his disposal for study.

The writer has nothing to add to the description of the species. However, the anterior end of the female is figured to illustrate the detailed structure of the buccal capsule. The worm is recorded here for the first time from Andhra Pradesh. The principal measurements of the material which consists only females are noted below:

Female: Length, 2.16 — 2.9 mm.; ma-



Cameronia biovata Basir, 1948

Fig. 114. Entire female, lateral view.
Fig. 115. Anterior end, female, lateral view.

Fig. 116. Head end, female, lateral view.
Fig. 117. Posterior end, female, lateral view.

ximum width, 0.138 — 0.21 mm.; 1st annule, 0.01 — 0.012 mm. wide and 2nd 0.025 — 0.03 mm.; buccal capsule, 0.013 — 0.018 mm. long by 0.007 mm. wide; oesophagus, 0.322 — 0.361 mm. long; corpus measuring 0.154 — 0.169 mm. by 0.048 — 0.054 mm.; isthmus 0.012 — 0.018 mm. by 0.024 — 0.03 mm.; valvular bulb 0.072 — 0.078 mm. by 0.9 mm.; nerve ring, 0.265 mm. from anterior end; vulva, 1.3 — 1.77 mm. from head end; tail, 0.28 — 0.36 mm. long; eggs, 0.071 mm. long by 0.036 — 0.044 wide.

Host: Aquatic beetle.

Habitat: Rectum.

Locality: Vizianagram, Andhra Pradesh (India).

Cameronia Basir, 1948

Cameronia biovata Basir, 1948

(Figs. 114-117)

BASIR (1948) established the genus *Cameronia* and designated as its type *Cameronia biovata* which he described from the Cricket, *Gryllotalpa africana* in Aligarh.

Subsequently TRAVASSOS (1953) redescribed this species from South America. The writer recovered a single female specimen from the same host in Hyderabad. The measurements of the specimen examined are noted below:

Female: Length, 4.26 mm.; greatest width, 0.51 mm.; 1st annule, 0.013 mm. wide, succeeding annules in oesophageal region 0.008 mm. wide; oesophagus, 0.446 mm. long; corpus measuring 0.312 mm. by 0.048 mm.; isthmus, 0.01 mm. by 0.03 mm.; bulb 0.126 mm. by 0.128 mm.; nerve ring, surrounding corpus at 0.216 mm.; tail, 0.21 mm. long; eggs, 0.096 mm. long by 0.05 — 0.056 mm. wide.

From the data given above it is clear that the measurements of the tail, oeso-

phagus and its constituent parts are approximately the same as given by BASIR and TRAVASSOS. But a marked difference is observed with regard to the length of body. BASIR records it as 2.35 — 2.5 mm. and TRAVASSOS as 2.8 — 3.9 mm., whilst the specimen under study is 4.26 mm. long. This apparent increase in length of body, which has not affected the length of the oesophagus and its constituent parts, is probably due to the gravid condition of the female under study; the uterus having assumed huge proportions with tightly packed eggs.

The species is here recorded for the first time from Hyderabad.

Host: *Gryllotalpa africana*.

Habitat: Intestine.

Locality: Hyderabad, Andhra Pradesh (India).

SUMMARY

1. *Thelastoma indica*, sp. nov. is described and compared with the allied species.
2. The species *Schwenkiella icemi* and *Gryllophila skrjabini* are recorded from South India and their principal measurements noted.
3. New males of *Binema korsakowi* and *B. mirzaia* are described and the structure of the male tails of these two species and that of *B. ornata* compared. Measurements of females of all three species are also recorded.
4. *Isobinema flagellocerca* gen. nov., sp. nov. is described in detail. The new genus is defined and its affinities discussed.
5. *Psilocephala psilocephala* gen. nov., sp. nov. is described. The new genus is compared with the related genera and its generic diagnosis is given.
6. The species *Pseudonymus hydrophili* and *Cameronia biovata* are reported from South India and the measurements of the material studied are recorded.

SYSTEMATIC LIST OF NEMATODE PARASITES
FOUND IN INSECTS AND OTHER ARTHRO-
PODS DESCRIBED IN THIS WORK

PART I

Fam: *Travassosinematidae* fam. nov.
Sub-Fam: *Travassosinematinae* sub-fam.
nov.

I Genus: *Indiana* Chakravarty, 1943.
(1) *Indiana gryllotalpae*

II Genus: *Travassosinema* gen. nov.
(2) *Travassosinema travassosi*
gen. nov., sp. nov.

Fam: *Rhigonematidae* Artigas, 1930
Sub-Fam: *Rhigonematinae* Artigas, 1926

III Genus: *Dudekemia* Artigas, 1930
(3) *Dudekemia subtruncatum*
(Dollfus, 1952)

Sub-Fam: *Carnoyinae* Filipjev, 1934

IV Genus: *Rondonema* Artigas, 1926
(4) *Rondonema spinifera* sp.
nov.

Fam: *Oxyuridae* Cobbold, 1864

V Genus: *Singhiella* gen. nov.
(5) *Singhiella singhi* gen. nov.,
sp. nov.

VI Genus: *Mirzaiella* Basir, 1942
(6) *Mirzaiella asiatica* Basir, 1942

VII Genus: *Chitwoodiella* Basir, 1948
(7) *Chitwoodiella asiatica* Ba-
sir, 1948

VIII Genus: *Pteronemella* gen. nov.
(8) *Pteronemella macropapilla-*
ta gen. nov., sp. nov.

PART II

Fam: *Aoruridae* Skrjabin et Schiko-
balova, 1951

Sub-Fam: *Aorurinae* Walton, 1927

IX Genus: *Coronostoma* gen. nov.
(9) *Coronostoma singhi* gen.
nov., sp. nov.

X Genus: *Hammerschmidtella* Chitwood,
1932

(10) *Hammerschmidtella die-*
singi (Hammerschmidt, 1838)
Chitwood, 1932.

(11) *H. manohari* sp. nov.

Sub-Fam: *Blattophilinae* Skrjabin et Schi-
kabalova, 1951

XI Genus: *Blattophila* Cobb, 1920

(12) *Blattophila suppellaima*
Basir, 1941

XII Genus: *Leidynema* Schwenk, 1929

(13) *Leidynema appendiculata*
(Leidy, 1850) Schwenk, 1929.

PART III

Fam: *Thelastomatidae* Travassos, 1929
Sub-Fam: *Thelastomatinae* Travassos, 1929

XIII Genus: *Thelastoma* Leidy, 1849

(14) *Thelastoma indica* sp. nov.

XIV Genus: *Schwenkiella* Basir, 1956

(15) *Schwenkiella icemi* (Sch-
wenk, 1926) Basir, 1956.

XV Genus: *Gryllophila* Basir, 1942

(16) *Gryllophila skrjabini* (Ser-
giev, 1923) Basir, 1956.

XVI Genus: *Binema* Travassos, 1925

(17) *Binema korsakowi* (Ser-
giev, 1923) Basir, 1956.

(18) *Binema ornata* Travassos,
1925

(19) *Binema mirzaia* (Basir,
1942) Basir, 1956

XVII Genus: *Isobinema* gen. nov.

(20) *Isobinema flagellocerca* gen.
nov., sp. nov.

XVIII Genus: *Psilocephala* gen. nov.

(21) *Psilocephala psilocephala*
gen. nov., sp. nov.

XIX Genus: *Pseudonymus* Diesing, 1857

(22) *Pseudonymus hydrophili*
(Galeb, 1878) Stiles & Hassall,
1905.

XX Genus: *Cameronia* Basir, 1948

(23) *Cameronia biovata* Basir,
1948.

CLASSIFIED LIST OF ARTHROPODS WITH NEMATODE PARASITES DESCRIBED FROM THEM IN THIS WORK

HOST	PARASITES DESCRIBED
Class: <i>Insecta</i>	
Family: <i>Gryllidae</i>	
Genus: <i>Gryllotalpa</i>	
Species: <i>G. africana</i>	(1) <i>Indiana gryllotalpae</i>
	(2) <i>Singhiella singhi</i> gen. nov., sp. nov.
	(3) <i>Chitwoodiella ovoides</i>
	(4) <i>Mirzaiella asiatica</i>
	(5) <i>Binema korsakowi</i>
	(6) <i>Binema ornata</i>
	(7) <i>Binema mirzaia</i>
	(8) <i>Isobinema flagellocerca</i> gen. nov., sp. nov.
	(9) <i>Psilocephala psilocephala</i> gen. nov., sp. nov.
	(10) <i>Gryllophila gryllophila</i>
	(11) <i>Pteronemella macropapillata</i> gen. nov., sp. nov.
	(12) <i>Cameronia biovata</i> .
Family: <i>Blattidae</i>	
Genus: <i>Periplaneta</i>	
Species: <i>P. americana</i>	(13) <i>Schwenkiella icemi</i>
	(14) <i>Hammerschmidtella diesingi</i>
Genus: <i>Blatta</i>	
Species: <i>B. orientalis</i>	(15) <i>Leidynema appendiculata</i>
Genus: <i>Supella</i>	
Species: <i>S. supellectillum</i>	(16) <i>Blattophila suppelaima</i>
Class: <i>Diplopoda</i>	
Genus: <i>Spirostreptus</i>	
Species: <i>Spirostreptus</i> sp.	(17) <i>Coronostoma singhi</i> gen. nov., sp. nov.
	(18) <i>Travassosinema travassosi</i> gen. nov., sp. nov.
	(19) <i>Hammerschmidtella manohari</i> sp. nov.
	(20) <i>Dudekemia subtruncatum</i>
	(21) <i>Thelastoma indica</i> sp. nov.
Class: <i>Chilopoda</i>	
Genus: <i>Rhisida</i>	
Species: <i>R. longipes</i>	(22) <i>Rondonema spinifera</i> sp. nov.
Aquatic beetle.	(23) <i>Pseudonymus hydrophili</i> .

SUMARIO

O autor estuda nematódeos parasitos de artrópodos indianos, compreendendo 23 espécies distribuídas em 20 gêneros e 4 famílias. Destas espécies, 9 são novas para a ciência, bem como propõe 6 novos gêneros e uma nova família e subfamília a saber:

Travassosinematidae fam. nov., incluindo 3 gêneros: *Travassosinematinae* subfam. nov.
Indiana Chakravarty, 1943 com uma espécie.

Indiana gryllotalpae Chakravarty, 1943.

Pulchrocephala Travassos, 1925, da América do Sul e não cogitada no trabalho.
Travassosinema gen. nov. com uma espécie: *Travassosinema travassosi* sp. nov.

Rhigonematidae Artigas, 1930, com os seguintes gêneros e espécies: *Rhigonematinae* Artigas, 1926;

Dudekemia Artigas, 1930

Dudekemia subtruncatum (Dollfus, 1952)

- Carnoyinae* Filipjev, 1926
Rondonema Artigas, 1926
Rondosema spinifera sp. nov.
- Oxyuridae* Cobbold, 1864, com os seguintes gêneros e espécies:
Singhiella gen. nov.
Singhiella singhi sp. nov.
Mirzaiella Basir, 1942
Mirzaiella asiatica Basir, 1942
Chitwoodiella Basir, 1945
Chitwoodiella ovoides Basir, 1945
Pteronemella gen. nov.
Pteronemella macropapillata sp. nov.
- Aoruridae* Skrjabin & Schikobalova, 1951
 com os seguintes gêneros e espécies:
Aorurinae Walton, 1927
Coronostoma gen. nov.
Coronostoma singhi sp. nov.
Hammerschmidtella Chitwood, 1932
Hammerschmidtella diesingi (Hammerschmidt, 1838)
Hammerschmidtella manohari sp. nov.
- Blattophilinae* Skrjabin & Schikhobalova, 1951
Blattophila Cobb, 1920
Blattophila suppellaima Basir, 1941
Leidynema Schwenk, 1929
Leidynema appendiculata Leidy, 1850
- Thelastomatidae* Travassos, 1929, com os seguintes gêneros e espécies:
Thelastomatinae Travassos, 1929
Thelastoma Leidy, 1849
Thelastoma indica sp. nov.
- Schwenkiella* Basir, 1956
Schwenkiella icemi (Schwenk, 1926)
- Gryllophila* Basir, 1942
Gryllophila skrjabini (Sergiev, 1923)
 = *G. gryllophila* Basir, 1942 = *Neyraiella neyrae* Serrano Sanches, 1947
- Binema* Travassos, 1925
Binema korsakowi (Sergiev, 1923)
 = *B. binema* Travassos, 1925; = *Gryllocola gryllocola* Basir, 1942;
 = *B. (Binema) hispana* Serrano Sanches, 1947; = *Binema (Binema) medinae* Serrano Sanches, 1947
- Binema ornata* Travassos, 1925
 = *Talpicola talpicola* Basir, 1942; = *Binema (Ornata) techae* Serrano Sanches, 1947; = *Binema (Ornata) carmeloi* Serrano Sanches, 1947
 = *Binema mirzaia* (Basir, 1942)
 = *Periplaneticola periplaneticola*, Basir, 1942
Isobinema gen. nov.
Isobinema flagellocerca sp. nov.
Psilocephala gen. nov.
Psilocephala psilocephala sp. nov.
Pseudonymus Diesing, 1857
Pseudonymus hydrophili (Galeb, 1878)
 = *Galebiella galebiella* Basir, 1941;
 = *Pseudonymus brachycercus* Todd, 1944; = *Pseudonymus leptocercus* Todd, 1944
Cameronia Basir, 1948
Cameronia biovata Basir, 1948

REFERENCES

- ARTIGAS, P., 1926 — "Nematoides de Invertebrados. *Bol. Biol. cl. Zool. Brasil.* 4, 97-110. (W. L. 3061b).
 (W. L. 3061b).
- ARTIGAS, P., 1926 — "Nematoides de Invertebrados III. *Bol. Biol. cl. Zool. Brasil.* 3, 59-71. (W. L. 3061b).
- BASIR, M. A., 1941 — "A new species of the Nematode Genus *Blattophila* Cobb, 1920 from a cockroach'. *Curr. Sci.* 19 (10), 443-445. (W. L. 7021n).
- BASIR, M. A., 1941 — "Two new Nematodes from an aquatic beetle'. *Proc. Ind. Acad. Sci.*, 13(3), 163-167. (W. L. 16756).
- BASIR, M. A., 1942 — "Nematodes parasitic in *Grylotalpa*'. *Rec. Indian Mus.*, 44(1), 95-106. (W. L. 17746).
- BASIR, M. A., 1948 — "*Chitwoodiella ovoides* Gen. et sp. Nov., a nematode parasite of *Grylotalpa*'. *Canad. J. Res.*, 26(1), 4-7. (W. L. 5898c).
- BASIR, M. A., 1949 — "A description of the Male of *Chitwoodiella ovoides* Basir, 1948 (Nematoda: Thelastomatidae)'. *Proc. helm. Soc. Wash.*, 16(2), 112-114. (W. L. 16747a).
- BASIR, M. A., 1956 — "Oxyuroid parasites of

- Arthropoda. A monographic study. 1. Thelastomatidae 2. Oxyuridae.' *Zoologica*, Stuttgart.
- BAYLIS, H. A. and DAUBNEY, R., 1926 — "A synopsis of the families and genera of Nematoda". London, British Mus.
- CHAKRAVARTY, G. K., 1943 — "On the nematode *Indiana gryllotalpae*. Gen. et sp. Nov. from Gryllotalpa Sp.' *Curr. Sci.* 12(1), 257-258. (W. L. 7021n).
- CHITWOOD, B. G., 1932 — "A synopsis of the Nematodes parasitic in insects of the family Blattidae". *Z. Parasitenk.*, 5(1), 14-50. (W. L. 23536b).
- CHITWOOD, B. G. and CHITWOOD, M. B. 1933. — "Nematodes parasitic in Philippine cockroaches". *Philipp. J. Sci.*, 52(4), 381-393. (W. L. 16189).
- CHITWOOD, B. G. and CHITWOOD, M. B. 1937. — "An Introduction to Nematology". Monumental Printing Company, Sect. 1, Part 1, Baltimore, Md. U. S. A.
- CHITWOOD, B. G. and CHITWOOD, M. B. 1938. — "An Introduction to Nematology". Monumental Printing Company, Sect. 1, Part 2, Baltimore, M.D. U. S. A.
- CHRISTIE, J. R., 1931. — "Some nemic parasites (Oxyuridae) of coleopterous larvae". *J. agri. Res.*, 42(8), 463-482. (W. L. 10966).
- COBB, N. A., 1920. — One hundred new nemas (type species of 100 new genera). *Contri. Sci. Nematology* 9, Waverly Press, Baltimore, 217.
- DOLLFUS, R. Ph., 1952. — "Quelques Oxyuroidea de Myriapodes". *Ann. Parasit. hum. Comp.*, 26(1-2-3), 143-236. (W. L. 899a).
- FILIPJEV, I. N. and SCHURMANS STEKHOVEN, J. H. Jr., 1941. — "A Manual of Agricultural Helminthology". Leiden H. J. Brill.
- LEIDY, J., 1849. — New genera and species of Entozoa'. *Proc. Acad. nat. Sci. Philad.*, 4, 230. (W. L. 16590).
- LEIDY, J., 1850. — "Description of some nematode entozoa infesting insects". *Proc. Acad. nat. Sci. Philad.* 5, 100-102. (W. L. 16590).
- LEIDY, J., 1851. — "Contributions to Helminthology". *Proc. Acad. nat. Sci. Philad.*, 5, 205-209. (W. L. 16590).
- LEIDY, J., 1851. — "Corrections and additions to former papers on helminthology published in the proc. of the Academy". *Proc. Acad. nat. Sci. Philad.*, 5, 284-290. (W. L. 16590).
- LEIDY, J., 1856. — "A synopsis of entozoa and some of their ectocongeners observed by the author". *Proc. Acad. nat. Sci. Philad.*, 8, 42-58.
- SERRANO SANCHEZ, A., 1947. — "Nematodes Parasitos intestinales de los Artropodos en España". *Rev. iber. Parasit.*, 7(2), 279-332. (W. L. 18858c).
- SKRJABIN, K. I., SCHIKHOBALOVA, N. P. & MOSCOVAII, A. A., 1951. — Identification of Parasitic Nematodes, Oxyurata and Ascaridata, Publication of Academy of Sciences, Moscow, 2: 1-631.
- TODD, A. C., 1941. — "Demonstration of a new parasite Nematode from Scavenger beetle". *J. Parasit.*, 27(6), Supl. 27.
- TODD, A. C., 1941. — An addition to the life history of *Leidynema appendiculata* (Leidy, 1850) Chitwood, 1932, a nematode parasitic in cockroaches". *J. Parasit.* 27(6), Supl. 34.
- TODD, A. C., 1942. — "A new parasitic nematode from a water scavenger beetle". *Trans. Amer. Micr. Soc.*, 61(4), 286-289. (W. L. 21400).
- TODD, A. C., 1943. — "*Thelastoma icemi* nematode of cockroaches". *J. Parasit.*, 29(6), 404-406.
- TODD, A. C., 1944. — "Two new nematodes from aquatic beetle *Hydrous triangularis* (Say.)". *J. Parasit.*, 30(4), 269-272.

- TODD, A. C., 1944. — On the development and hatching of the eggs of *Hammerschmidtella diesingi* and *Leidyne-ma appendiculatum*. *Trans. Amer. Micr. Soc.*, 63, 54-67.
- TRAVASSOS, L., 1925. — “Quelques nematodes du *Grylotalpa*”. *C. R. Soc. Biol.*, Paris, 93, 140-141. (W. L. 6630).
- TRAVASSOS, L., 1925. — “Contribuição ao conhecimento dos Nematodeos dos Arthropodes”. *Sci. med.*, Rio de Janeiro, 3, 3-9. (W. L. 19965d).
- TRAVASSOS, L., 1953. — “Nematodeos Parasitos de *Grylotalpa*”. Thapar Commemoration Volume, 227-288.